

Hypertension in Hispanic Americans, American Indians and Alaska Natives, and Asian and Pacific Islander Americans

February 1996

Office of Minority Health
Resource Center
PO Box 37337
Washington, DC 20013-7337

National Heart, Lung, and Blood Institute
Division of Epidemiology and Clinical Applications

U.S. Department of Health and Human Services
Public Health Service
National Institutes of Health
Bethesda, MD

Hypertension in Hispanic Americans, American Indians and Alaska Natives, and Asian and Pacific Islander Americans

February 1996

National Heart, Lung, and Blood Institute
Division of Epidemiology and Clinical Applications

U.S. Department of Health and Human Services
Public Health Service
National Institutes of Health
Bethesda, MD

17116D2830

Contents

List of Illustrations	iv
Foreword	vii
Introduction	ix
Acknowledgments	xi
 Section I. Hypertension in Hispanic Americans	
Overview	1
Study Descriptions	2
 Section II. Hypertension in American Indians and Alaska Natives	
Overview	25
Study Descriptions	26
 Section III. Hypertension in Asian and Pacific Islander Americans	
Overview	43
Study Descriptions	44
 References	61
 Appendix: Data Tables	63

Illustrations

Tables

1-1	Study Design Summary	
1-2	Hispanic Studies	7
	Blood Pressure Measurement Protocols	
	Hispanic Studies	8
2-1	Study Design Summary	
	American Indian and Alaska Native Studies	29
2-2	Blood Pressure Measurement Protocols	
	American Indian and Alaska Native Studies	30
3-1	Study Design Summary	
	Asian and Pacific Islander American Studies	47
3-2	Blood Pressure Measurement Protocols	
	Asian and Pacific Islander American Studies	48

Figures

1-1	Mean Systolic Blood Pressure: Hispanic Americans Aged 18 Years and Over, Part I	9
1-2	Mean Diastolic Blood Pressure: Hispanic Americans Aged 18 Years and Over, Part I	10
1-3	Mean Systolic Blood Pressure: Hispanic Americans Aged 18 Years and Over, Part II	11
1-4	Mean Diastolic Blood Pressure: Hispanic Americans Aged 18 Years and Over, Part II	12
1-5	Mean Systolic Blood Pressure: Hispanic American Males and Females Aged 45-64 Years	13
1-6	Mean Diastolic Blood Pressure: Hispanic American Males and Females Aged 45-64 Years	14
1-7	Mean Body Mass Index: Hispanic Americans Aged 18 Years and Over, Part I	15
1-8	Mean Body Mass Index: Hispanic Americans Aged 18 Years and Over, Part II	16
1-9	Prevalence of Diabetes: Hispanic Americans Aged 18 Years and Over	17
1-10	Prevalence of Hypertension by Stage: Hispanic American Males and Females Aged 45-64 Years	18
1-11	Awareness, Treatment, and Control of Hypertension: Hispanic Americans Aged 45-64 Years	19
1-12	Prevalence of Hypertension by Glucose Tolerance: Hispanic Americans Aged 45-64 Years	20
1-13	Mean Systolic Blood Pressure: Hispanic American Children Aged 3-18 Years	21
1-14	Mean Diastolic Blood Pressure: Hispanic American Children Aged 3-18 Years	22
1-15	Prevalence of Blood Pressure Above the 90th Percentile: Hispanic American Children Age 3-18 Years	23
2-1	Mean Systolic Blood Pressure: American Indians Aged 18 Years and Over	31
2-2	Mean Diastolic Blood Pressure: American Indians Aged 18 Years and Over	32

Illustrations

Figures (continued)

2-3	Mean Systolic Blood Pressure: American Indian Males and Females Aged 45-64 Years	33
2-4	Mean Diastolic Blood Pressure: American Indian Males and Females Aged 45-64 Years	34
2-5	Mean Systolic Blood Pressure: Yupik Eskimos Aged 18 Years and Over	35
2-6	Mean Diastolic Blood Pressure: Yupik Eskimos Aged 18 Years and Over	36
2-7	Mean Body Mass Index: American Indians Aged 18 Years and Over	37
2-8	Prevalence of Diabetes: American Indians Aged 18 Years and Over	38
2-9	Prevalence of Hypertension by Stages: American Indian and Alaska Native Males and Females Aged 45-64 Years	39
2-10	Awareness, Treatment, and Control of Hypertension: American Indians Aged 45-64 Years	40
2-11	Prevalence of Hypertension by Glucose Tolerance: American Indians Aged 45-64 Years	41
3-1	Mean Systolic Blood Pressure: Asian and Pacific Islander Americans Aged 18 Years and Over, Part I	49
3-2	Mean Diastolic Blood Pressure: Asian and Pacific Islander Americans Aged 18 Years and Over, Part I	50
3-3	Mean Systolic Blood Pressure: Asian and Pacific Islander Americans Aged 18 Years and Over, Part II	51
3-4	Mean Diastolic Blood Pressure: Asian and Pacific Islander Americans Aged 18 Years and Over, Part II	52
3-5	Mean Systolic Blood Pressure: Asian and Pacific Islander American Males and Females Aged 45-64 Years	53
3-6	Mean Diastolic Blood Pressure: Asian and Pacific Islander American Males and Females Aged 45-64 Years	54
3-7	Mean Body Mass Index: Asian and Pacific Islander Americans Aged 18 Years and Over, Part I	55
3-8	Mean Body Mass Index: Asian and Pacific Islander Americans Aged 18 years and Over, Part II	56
3-9	Diabetes Prevalence: Asian and Pacific Islander Americans Aged 18 Years and Over	57
3-10	Mean Systolic Blood Pressure: Asian and Pacific Islander American Children Aged 3-18 Years	58
3-11	Mean Diastolic Blood Pressure Asian and Pacific Islander American Children Aged 3-18 Years	59

Foreword

The National Heart, Lung, and Blood Institute (NHLBI) supports the scientific gathering and interpretation of epidemiological data on hypertension and other cardiovascular diseases. Such data are crucial in order to determine needed areas of research, both basic and clinical, as well as the best approaches to prevent and treat hypertension.

One area where data is particularly needed is hypertension among minority populations in the United States. For various reasons, such data are largely lacking. These reasons include the biological and cultural diversity of America's minorities, and their wide dispersal across the country. Additionally, key data such as death certificate information have sometimes not been recorded, forever lost to future epidemiologists.

And, of course, epidemiologists themselves create their own challenges. Data have been collected using different methodologies and different definitions, thereby limiting the full use of the data.

This chart book was prepared to begin to fill this gap. It represents the foundation for what promises to become an invaluable database in this area. It contains both data from and research-design descriptions of key epidemiological studies on hypertension and minorities.

But the chart book is only a first step, and much more work lies ahead. To build on this foundation, public health professionals must make a commitment to share and develop existing data on minorities. They also need to work closely with minority communities nationwide to identify issues for future research.

Only then will the frequency and severity of hypertension and its risk factors among minorities in the United States be reduced.

Claude Lenfant, M.D.
Director
National Heart, Lung, and Blood Institute

Introduction

Significant risk for several diseases, including cardiovascular disease, stroke, and renal disease, is associated with both hypertension and borderline elevated blood pressure. Identifying and reducing the major independent risk factors (hypertension, hypercholesterolemia, and cigarette smoking) have helped lower mortality from cardiovascular disease and stroke in the United States. Risk factors, however, are not evenly distributed across populations in the United States, and not all groups at high risk have been identified and reached by appropriate preventive efforts. The health of racial minorities is of major importance, since by the year 2000 they are expected to comprise 25 percent of the U.S. population. To date, most health research in minority populations has been directed toward Black populations where hypertension-related morbidity and mortality are much higher than in White populations.

Recent immigration has created large populations of Hispanic and Asian and Pacific Islander Americans. In addition, despite improvements in recent decades, the health status of American Indians and Alaska Natives lags behind that of other Americans. These groups are all composed of subgroups that differ culturally, socioeconomically, educationally, and ethnically. Available data about cardiovascular risk factors in these populations are sparse. Most information about hypertension in Hispanic Americans has been collected from those of Mexican origin living in the southwestern United States, while most data on Asian and Pacific Islander Americans relates to Japanese Americans. Because of the variation in the distribution of hypertension and other risk factors, and the variation in the relative magnitude of the risk factors as disease predictors, it is important to establish

baseline data for minority groups in order to improve public health efforts.

In an effort to assemble a database on the prevalence of hypertension in Hispanic American, American Indian and Alaska Native, and Asian and Pacific Islander American populations, the National Heart, Lung, and Blood Institute (NHLBI) invited expert consultants to join with staff of the NHLBI to form a Planning Committee for this project. The committee reviewed the relevant research studies and selected a group of recent studies they considered appropriate for inclusion. The Multiple Risk Factor Intervention Trial (MRFIT) screening data were included because of the large sample size and because both Hispanics and Asians were included even though the data were collected earlier than in the other studies and include only men. In addition, data for Blacks and Whites from the first phase of the Third National Health and Nutrition Survey (NHANES III) were also included for comparative purposes.

Once the studies for inclusion were selected, a representative of each study was invited to participate in the project by supplying summary data in a specified format for inclusion in the database and by participating in a workshop entitled, The Epidemiology of Hypertension in Hispanic Americans, Native Americans, and Asian/Pacific Islander Americans. The workshop was held in Washington, DC, June 20 to 21, 1994. The summary information provided for the various studies is abstracted in this report.

The data are presented as charts organized by ethnic group. The charts relate to mean levels of blood pressure and

prevalence of hypertension as well as the treatment and control of hypertension. Because of the high prevalence of obesity and non-insulin dependent diabetes in some of these groups and the relation of these factors to hypertension, mean body mass index (BMI) and prevalence of diabetes are also presented. Not all studies were able to provide all the information requested. The Appendix tables provide age- and sex-specific values for mean systolic and diastolic blood pressure, prevalence of hypertension, and the percent of hypertensives aware, treated, and controlled. A brief description of each study with selected references is included at the beginning of each section. Because of differences in time periods of data collection, study designs, sampling methods, and blood pressure measurement protocols, caution should be taken when comparing the data among studies.

The Databook was prepared for publication by The CDM Group, Inc., under contract #NHLBI-HC-93-06.

Interested parties may request additional free copies of this Databook from the National Heart, Lung and Blood Institute Education Programs Information Center, P.O. Box 30105, Bethesda, Maryland, 20824-0105, (301) 251-1222.

Acknowledgments

The National Heart, Lung, and Blood Institute gratefully acknowledges all the individuals who contributed to the development of this report, which was prepared by The CDM Group, Inc., Chevy Chase, Maryland.

Planning Committee

Matilde Alvarado, R.N., M.S.N., Minority Program Specialist, Health Education Branch, Office of Prevention, Education, and Control, National Heart, Lung, and Blood Institute, Bethesda, Maryland.

Vicki L. Burt, Sc.M., R.N., Branch Chief, Survey Planning and Development Branch, National Center for Health Statistics, Center for Disease Control and Prevention, Hyattsville, Maryland.

Wilfred Fujimoto, M.D., Professor of Medicine, University of Washington School of Medicine.

Helen Hazuda, Ph.D., Associate Professor of Medicine, The University of Texas, Health Science Center at San Antonio.

Barbara Howard, Ph.D., President, Medlantic Research Institute, Washington, D.C.

Jacob Keller, M.P.H., Project Officer, Epidemiology and Biometry Program, Division of Epidemiology and Clinical Applications, National Heart, Lung, and Blood Institute, Bethesda, Maryland.

Gerald Payne, M.D., Associate Director for Scientific Programs, Division of Epidemiology and Clinical Applications, National Heart, Lung, and Blood Institute, Bethesda, Maryland.

Edward Roccella, Ph.D., M.P.H., Coordinator, National High Blood Pressure Education Program, Office of Prevention, Education, and Control, National Heart, Lung, and Blood Institute, Bethesda, Maryland.

Mary C. Smolenski, C.R.N.P., Ed.D., Project Director, The CDM Group, Inc., Chevy Chase, Maryland.

Study Representatives

Kelly Acton, M.D., Indian Health Service Diabetes Program
The Indian Health Service Study

Gerald Berenson, M.D., Tulane University School of Public Health
The Brooks County Heart Study

Vicki Burt, R.N., Sc.M., National Center for Health Statistics
Centers for Disease Control and Prevention
National Health and Nutrition Examination Survey III

Maximilian de Courten, M.D., National Institute of Diabetes and Digestive and Kidney Diseases
The Pima Indian Study

Carlos Crespo, Dr.P.H., M.S., National Heart, Lung, and Blood Institute, Office of Prevention, Education, and Control Hispanic Health and Nutrition Examination Survey

J. David Curb, M.D., University of Hawaii
The Honolulu Heart Program and the Molokai Heart Study

Sven Ebbesson, Ph.D., University of Alaska Fairbanks
The St. Lawrence Island Study

Wilfred Fujimoto, M.D., University of Washington
The Seattle Japanese American Diabetes Study

Tim Gilbert, M.P.H., R.D., Fred Hutchinson Cancer Research Center
Navajo Adolescents' Study

Steve Haffner, M.D., University of Texas, San Antonio
San Antonio Heart Study Phases I & II and the Mexico City Diabetes Study

Craig Hanis, Ph.D., University of Texas, Houston
Starr County Study

Helen Hazuda, Ph.D., University of Texas, San Antonio
San Antonio Heart Study Phases I & II and the Mexico City Diabetes Study

Barbara Howard, Ph.D., Medlantic Research Institute
The Strong Heart Study

Nichinori Imazu, M.D., Hiroshima University
The Hawaii/Los Angeles/Hiroshima Study

Kiang Liu, Ph.D., Northwestern University
Chicago School Children's Study

Catherine Loria, M.S., M.A., National Center for Health Statistics, Centers for Disease Control and Prevention
Hispanic Health and Nutrition Examination Survey

Christopher Percy, M.D., D.C.H.S., Indian Health Service,
New Mexico
The Navajo Health and Nutrition Study

Marian Rewers, M.D., Ph.D., University of Colorado,
Denver
The San Luis Valley Diabetes Study

Roger Sherwin, M.B., B.Chir., University of Maryland
School of Medicine
The Multiple Risk Factor Intervention Trial Screening Data

Irene S. Tekawa, M.A., Kaiser Permanente Medical Center
Kaiser Permanente Study

Marilyn Winkleby, Ph.D., Stanford University
The Stanford Five-City Project

Expert Consultants to The CDM Group, Inc.

Stephen Havas, M.D., M.P.H., M.S., Associate Professor,
Department of Epidemiology and Preventive Medicine,
University of Maryland School of Medicine

Roger Sherwin, M.B., B.Chir., Professor, Department of
Epidemiology and Preventive Medicine, University of
Maryland School of Medicine

Perry D. Cohen, Ph.D., Perry Cohen Associates,
Washington, DC

Staff Members of The CDM Group, Inc.

Nicole C. Close, M.S., Scientific Coordinator
Cecil Gross, Graphic Specialist
Patricia Green, M.Ed., Corporate Supervisor
Mary C. Smolenski, C.R.N.P., Ed.D., Project Director
Jennie E. Heard, M.A., Editor
Marilyn Spear, B.A., Quality Control Specialist
Annie Acosta, M.S.W., Research Assistant
Lacie Gray, M.S.W., Research Assistant
Niyati Pandya, M.L.S., Information Specialist
Lisa Rimmington, B.A., Production Coordinator

Section I. Hypertension in Hispanic Americans

Overview

Hispanics represent a mosaic of ethnic groups in the United States. They trace their origins to numerous Spanish-speaking countries with distinct national histories and heritages.

There are more than 23 million Hispanics in the United States. About six of every 10 Hispanics are of Mexican heritage.¹ In addition to the Mexican Americans, the U.S. Census distinguishes among Puerto Rican, Cuban American, Central and South American, and "Other" Hispanics. The bulk of the Hispanic population is concentrated in the Southwestern states and in Florida, New York, New Jersey, and Illinois. The majority live in large metropolitan areas.¹

Hispanics are one of the fastest-growing segments of the U.S. population. As a result of high birth rates and significant levels of immigration, this population more than doubled between 1970 and 1990. This is also a very young population. According to the U.S. Bureau of the Census, almost 7 of every 10 Hispanics in 1990 were under the age of 35 years, as compared to about 50 percent of non-Hispanics.¹

Education and socioeconomic levels among Hispanics, as a whole, are below those of non-Hispanics.¹ Both high school and college completion rates are significantly lower, although these rates fluctuate significantly among the Hispanic groups. Similarly, despite subgroup variations, overall poverty rates are higher for Hispanics than for the general population. The 1990 census figures show that more than 20 percent of Hispanic families were living below poverty level.¹

Hispanics exhibit several risk factors for major health problems, most notably high smoking rates among men,² diets high in fat and sodium,³ and above average incidence of alcoholism⁴ and obesity.^{5,6} Despite these factors, the rate of cardiovascular disease is lower than that of non-Hispanic Whites. However, Hispanics, and Mexican Americans in particular, are three to five times more likely to have noninsulin-dependent diabetes than non-Hispanic Whites.⁷

Studies show differing rates of hypertension among Hispanics. The Hispanic Health and Nutrition Examination Survey (HHANES) conducted in the early 1980's found a lower prevalence of hypertension in Hispanics than in non-Hispanic Whites.¹ The survey reported findings in three groups: Mexican Americans in the Southwest, Puerto Ricans in the New York City metropolitan area, and Cuban Americans in Dade County, Florida. However, other studies in San Antonio, Texas,⁸ and in Orange County, California,⁹ found similar prevalence of hypertension among Hispanics and non-Hispanic Whites.

Study Descriptions

The following are descriptions of the studies included in this section. Each description provides a brief overview of an individual study's timeframe, sample, design, and primary objectives. Although this section focuses on data from the Hispanic American population, the descriptions provided may refer to a study's larger, overall population and study design. A more detailed explanation of the study design and findings may be found within the references following each study description.

A shortened study name is enclosed within parentheses following the name of each study. These are used in place of the longer study names on all figures and tables.

The Brooks County Heart Study (Brooks County)

The Brooks County Heart Study was conducted on Hispanic children in Brooks County, Texas, a rural county in southern Texas. The population is 95 percent Hispanic (Mexican American). A 25 percent random sample of children enrolled in kindergarten through twelfth grade (public school) participated in the study between 1984 and 1985. A total of 401 Hispanic children between the ages of 5 and 17 years were examined in a general cardiovascular screening.

References:

Webber LS, Harsha DW, Phillips GT, et al. Cardiovascular risk factors in Hispanic, white, and black children: the Brooks County and Bogalusa Heart studies. *Am J Epidemiol*. 1991 Apr 1;133(7):704-14.

Burke GL, Arcilla RA, Culpepper WS, et al. Blood pressure and echocardiographic measure in children: the Bogalusa Heart Study. *Circulation*. 1987 Jan;75(1):106-14.

Newman WP 3rd, Freedman DS, Voors AW, et al. Relation of serum lipoprotein levels and systolic blood pressure to early atherosclerosis: the Bogalusa Heart Study. *N Engl J Med*. 1986 Jan 16;314(13):138-44.

Soto LF, Kikuchi DA, Arcilla RA, et al. Echocardiographic functions and blood pressure levels in children and young adults from a biracial population: the Bogalusa Heart Study. *Am J Med Sci*. 1989;297:271-9.

Tracy RE, Mercante DE, Moncada A, et al. Quantitation of hypertensive nephrosclerosis on an objective rationale scale of measure in adults and children. *Am J Clin Pathol*. 1986 Mar;85(3):312-8.

Voors AW, Berenson GS, Dalferes ER Jr, et al. Racial differences in blood pressure control. *Science*. 1979 Jun 8;204(4397):1091-4.

The Chicago School Children's Study (Chicago Children)

From 1975 to 1978, the Chicago Department of Health conducted a health screening program that included blood pressure and various anthropometric measurements for children in non-public schools. The children classified themselves as White, Black, Asian, and Latino (Mexican, Puerto Rican, and other Latinos). The study provided an opportunity to examine

possible racial differences in blood pressure and anthropometric measurements. A total of 1,318 boys and 1,548 girls aged 6 to 9 years were screened.

Reference:

Levinson S, Liu K, Stamler J, et al. Ethnic differences in blood pressure and heart rate of Chicago school children. *Am J Epidemiol.* 1985;122(3):366-77.

Hispanic Health and Nutrition Examination Survey (HHANES)

The Hispanic Health and Nutrition Examination Survey (HHANES), conducted between 1982 and 1984 by the National Center for Health Statistics, sampled non-institutionalized Mexican Americans residing in five Southwestern States (Arizona, California, Colorado, New Mexico, and Texas), Cuban Americans living in Dade County, Florida, and Puerto Ricans residing in the New York City area. The analytic sample consisted of 7,462 Mexican Americans, 1,357 Cuban Americans, and 2,834 Puerto Ricans. The HHANES collected extensive information on health and nutritional status, as well as information on lifestyle and acculturation.

References:

National Center for Health Statistics: Plan and operation of the HHANES, 1982-1984. Washington, DC: Government Printing Office, September 1985; DHHS publication no. PHS 85-1321.

Delgado JL, Johnson CL, Roy I, et al. Hispanic Health and Nutrition Examination Survey: methodological considerations. *Am J Public Health.* 1990;80(Suppl):6-10.

Pappas G, Gergen PJ, Carroll M. Hypertension prevalence and the status of awareness, treatment, and control in the Hispanic Health and Nutrition Examination Survey (HHANES), 1982-84. *Am J Public Health.* 1990;80(12):1431-6.

Solis JM, Marks G, Garcia M, et al. Acculturation, access to care, and use of preventive services by Hispanics: findings from HHANES, 1982-84. *Am J Public Health.* 1990; 80(Suppl):11-9.

Sorel JE, Ragland DR, Syme SL. Blood pressure in Mexican Americans, whites, and blacks: The Second National Health and Nutrition Examination Survey and the Hispanic Health and Nutrition Examination Survey. *Am J Epidemiol.* 1991;134(4):370-8.

Sorel JE, Ragland DR, Syme SL, et al. Educational status and blood pressure: the second national health and nutrition examination survey, 1976-1980, and the Hispanic Health and Nutrition Examination Survey, 1982-1984. *Am J Epidemiol.* 1992 Jun 15;135(12):1339-48.

The Mexico City Diabetes Study (Mexico City)

The Mexico City Diabetes Study is a large, population-based study of diabetes and cardiovascular disease in men and women aged 35 to 64 years and was designed to provide comparative data on Mexican-origin populations residing in Mexico City, Mexico, and San Antonio, Texas. Data for the present report are from the first 1,702 of 2,283 subjects who participated in the study. The design of this study parallels the design of the San Antonio Heart Study, which preceded it. (See San Antonio Heart Study).

Reference:

Stern MP, Gonzalez C, Mitchell BD, et al. Genetic and environmental determinants of type II diabetes in Mexico City and San Antonio. *Diabetes*. 1992 Apr;41(4):484-92.

The Multiple Risk Factor Intervention Trial (MRFIT)

The Multiple Risk Factor Intervention Trial (MRFIT) screening team examined 361,662 men aged 35 to 57 years living in the contiguous United States. The screening took place in 22 clinical centers between 1973 and 1975. Participants identified themselves as "White," "Black," "Oriental," "Spanish-American," "American Indian," or "Other." Since the study was designed only to identify men eligible for the trial, no effort was made to obtain a representative sample of any defined population. The study provided, however, an opportunity to compare relatively large numbers of these ethnic groups with Whites.

While the study did not seek to obtain a representative sample of any defined population, it is considered a significant study of blood pressure levels in U.S. minority populations. For this section, MRFIT data on Hispanic Americans were extracted from the original aggregated data and are presented here with data from other studies of the prevalence of hypertension in Hispanic Americans.

References:

The multiple risk factor intervention trial (MRFIT). A national study of primary prevention of coronary heart disease. *JAMA*. 1976 Feb;235(8):825-7.

Statistical design considerations in the NHLI Multiple Risk Factor Intervention Trial (MRFIT). The Multiple Risk Factor Intervention Trial Group. *J Chron Dis*. 1977 May;30(5):261-75.

National Health and Nutrition Examination Survey (NHANES III)

The third National Health and Nutrition Examination Survey (NHANES III) blood pressure component was designed to assess the health and nutritional status of the civilian noninstitutionalized population of the United States. It was conducted in two phases, with each phase being an independent sample of the population, between 1988 and 1994, and includes a sample of approximately 40,000 persons. It includes both questionnaire and examination components. NHANES III was designed to oversample the Black and Mexican-American populations so that reliable estimates of health and nutritional characteristics can be produced for these two largest minority groups of the U.S. population. The data included here come from the first phase conducted between 1988 and 1991. The first phase of NHANES III was conducted by the National Center for Health Statistics, Centers for Disease Control and Prevention from 1988 to 1991.

References:

National Center for Health Statistics. Plan and operation of the Third National Health and Nutrition Examination Survey, 1988-94. Washington, DC: Government Printing Office, 1994; DHHS publication no. (PHS)94-1308.

Burt VL, Cutler JA, Higgins M, et al. Trends in the prevalence, awareness, treatment, and control of hypertension

in the adult U.S. population. Data from the health examination surveys, 1960 to 1991. Hypertension. 1995 Jul;26(1):60-9.

Burt VL, Whelton P, Roccella EJ, et al. Prevalence of hypertension in the U.S. adult population: Results from the Third National Health and Nutrition Examination Survey, 1988-91. Hypertension. 1995 Mar;25(3):305-13.

San Antonio Heart Study Phases 1 & 2 (San Antonio Heart 1&2)

The San Antonio Heart Study (SAHS) is a population-based study of diabetes and cardiovascular disease in Mexican Americans and non-Hispanic White men and women 25 to 64 years of age in the San Antonio, Texas, area. Recruitment of subjects in the study occurred in two phases: the first encompassed the period from October 1979 to November 1982, and the second from October 1984 to October 1988. Both phases consisted of independent random samples conducted in different groups of census tracts. Subjects for the SAHS were 3,301 Mexican American and 1,857 non-Hispanic White men and women aged 25 to 64 years at baseline. The pooled data from the two phases are presented in this report.

References:

Franco LJ, Stern MP, Rosenthal M, et al. Prevalence, detection, and control of hypertension in a biethnic community; the San Antonio Heart Study. Am J Epidemiol. 1985 May;121(5):684-96.

Stern MP, Rosenthal M, Haffner SM, et al. Sex difference in the effects of sociocultural status on diabetes and cardiovascular risk factors in Mexican Americans; The San Antonio Heart Study. Am J Epidemiol. 1984 Dec;120(6):834-51.

The San Luis Valley Diabetes Study (San Luis Valley)

The San Luis Valley Diabetes Study studied hypertension morbidity and risk factors in 1,791 Hispanics and non-Hispanic Whites from the rural San Luis Valley in Colorado. All persons in the San Luis Valley, Colorado, with a previous diagnosis of diabetes were ascertained. Those who were 20 to 74 years of age, current non-institutionalized residents of the area, and mentally competent and spoke either English or Spanish were eligible and invited to participate; 440 (81 percent) of the eligible persons participated. Subjects without a previous diagnosis of diabetes were randomly sampled from the community, stratifying by age, sex, ethnicity, and county; 1,351 (68 percent) of eligible non-diabetic subjects participated. The data for subjects from the non-diabetic sample are included here.

Reference:

Hamman RF, Marshall JA, Baxter J, et al. Methods and prevalence of non-insulin dependent diabetes mellitus in a biethnic Colorado population. The San Luis Valley Diabetes Study. Am J Epidemiol. 1989 Feb;129(2):295-311.

The Stanford Five-City Project (Stanford Five City)

The Stanford Five-City Project was a community-based cardiovascular disease intervention study, conducted in Northern California during the 1980's. This analysis presents comparative data for several blood pressure indicators for Hispanics and Whites, sampled from four cities and representing a broad spectrum of educational levels.

Households were randomly selected from two treatment and two control cities, but in a third control city, only morbidity and mortality rates were monitored. Data from this city are not included here. All persons aged 12 to 74 years were eligible to participate and were invited to attend clinics located in the communities. Data from participants 25 to 74 years of age were used for the current analysis. Each survey included approximately 1,800 to 2,500 participants (response rates were 65, 69, 65, 56, and 61 percent, respectively). Although 90 percent of Hispanics in the Five-City Project sample were of Mexican American origin, the analysis was not restricted to Mexican Americans because Mexican American respondents were not distinguishable from other Spanish surnamed respondents in the fourth survey.

References:

Farquhar JW, Fortmann SP, Maccoby N, et al. The Stanford five-city project: design and methods. *Am J Epidemiol.* 1985 Aug;122(2):323-34.

Winkleby MA, Fortmann SP, Rockhill B. Health-related risk factors in a sample of Hispanics and whites matched on sociodemographic characteristics. The Stanford Five-City Project. *Am J Epidemiol.* 1993;137(12):1365-75.

Starr County Study (Starr County)

From 1985 to 1986, researchers conducted a complete physical evaluation of, and took medical and nutritional histories from, a representative sample of Mexican Americans from Starr County, Texas. Blocks representative of population and dwelling unit densities were randomly selected from the three major towns in Starr County, Texas: Rio Grande City, La

Grulla, and Roma-Los Saenz. Individuals in all dwelling units on selected blocks were enumerated and one randomly selected individual aged 15 to 74 years, inclusively, was invited to a detailed physical evaluation including an array of medical, laboratory, historical and anthropometric measures. The final sample size was 1,004.

References:

Hanis CL, Ferrell RE, Barton SA, et al. Diabetes among Mexican-Americans in Starr County, Texas. *Am J Epidemiol.* 1983 Nov;118(5):659-72.

Hanis CL, Ferrell RE, Schull WJ. Hypertension and sources of blood pressure variability among Mexican-Americans in Starr County, Texas. *Int J Epidemiol.* 1985;14(1):231-8.

Table 1-1 Study Design Summary Hispanic Studies ¹					
Study	Ethnic Group/Subgroup	Ages (years)	Sample Size	Location	Study Dates
Brooks County	Mexican American	5-17	401	Brooks Co., TX	1984-85
Chicago Children	Mexican American Puerto Rican American Other Latino American	6-9	2,866	Chicago, IL	1975-78
HHANES	Mexican American Cuban American Puerto Rican American	6 mo.-74	7,462 1,357 2,834	CA, AZ, NM, CO, FL, TX, NY	1982-84
Mexico City	Mexican	25-74	2,283	Mexico City, Mexico	1984-88
MRFIT	Spanish-American ²	35-57	6,150	FL, NY, CA	1973-75
NHANES III	Mexican American	2 mo. and over	9,000	United States	1988-94
San Antonio Heart 1&2	Mexican American	25-64	3,301	San Antonio, TX	1979-82 1984-88
San Luis Valley	Hispanic American	25-74	1,691	Colorado	1984-88
Stanford Five City	Hispanic American ³	13-74	933	Northern California	1979-90
Starr County	Mexican American	15-74	1,004	Starr Co., TX	1985-86

¹This table includes study data that included native Hispanics; therefore, the table's title does not include the word "American" so as not to limit its scope.

²Although the term "Spanish-American" does not reflect current usage, the term is retained here since it was used in the study.

³Although 90 percent of Hispanics in the study were of Mexican-American origin, the analysis was not restricted to Mexican Americans.

<p>Table 1-2 Blood Pressure Measurement Protocols Hispanic Studies</p>				
Study	Random Zero Sphygmomanometer Used	Number of Readings	Readings Used	Participant Position
Brooks County	No	3	2nd & 3rd	Seated
Chicago Children	No	4	2nd & 3rd	Supine
HHANES	No	2	1st & 2nd	Seated
Mexico City	Yes	3	2nd & 3rd	Seated
MRFIT	No	3	2nd & 3rd	Seated
NHANES III	No	6	All	Seated
San Antonio Heart 1&2	Yes	3	2nd & 3rd	Seated
San Luis Valley	No	3	N.A.*	Supine
Stanford Five City	No	3	2nd & 3rd	Seated
Starr County	Yes	2	1st & 2nd	Supine

*Information not available.

Figure 1-1. Mean Systolic Blood Pressure
Hispanic Americans Aged 18 Years and Over, Part I

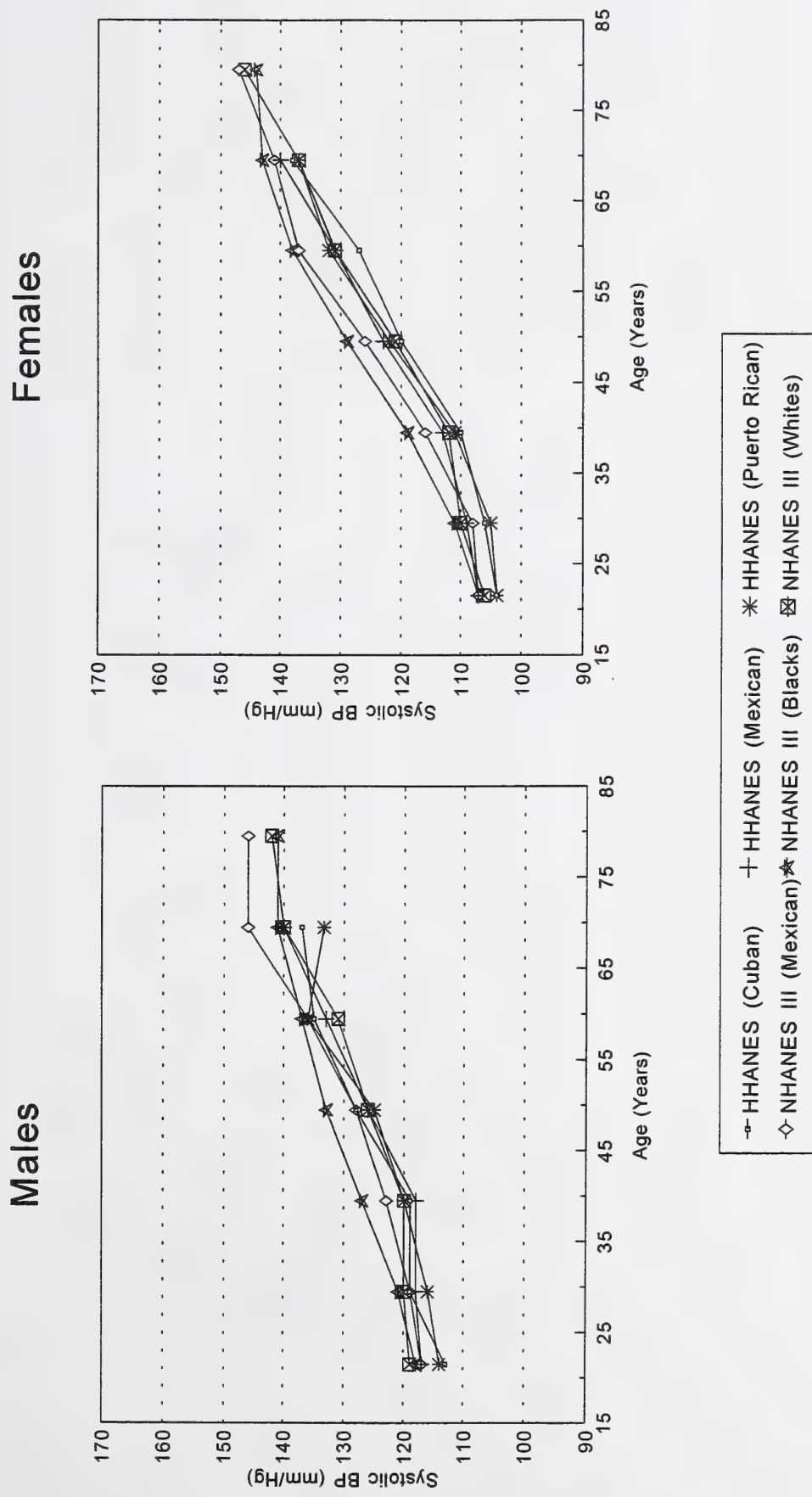
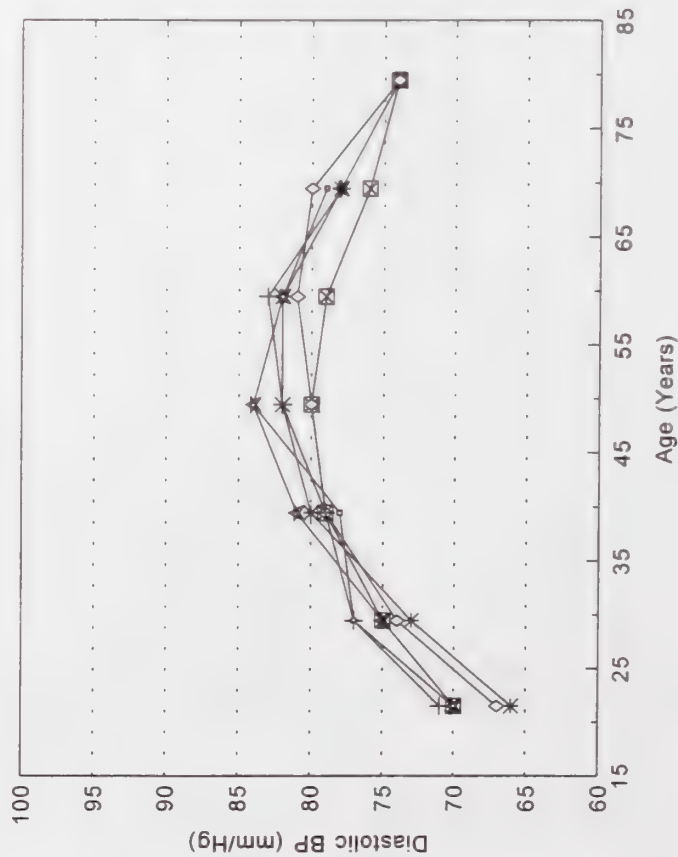


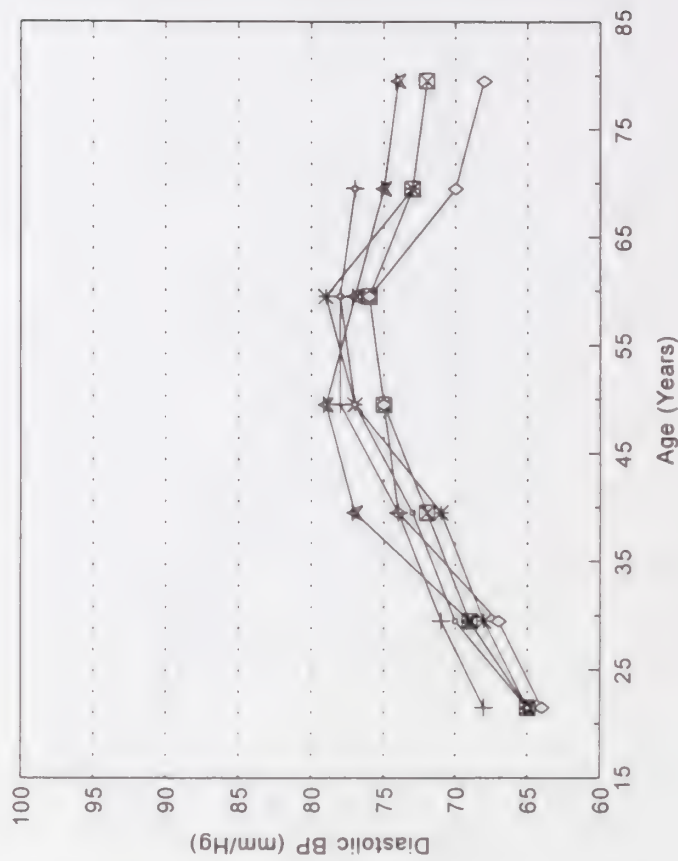
Figure 1-2. Mean Diastolic Blood Pressure

Hispanic Americans Aged 18 Years and Over, Part I

Males



Females



○ HHANES (Cuban) + HHANES (Mexican) * HHANES (Puerto Rican)
 ◇ NHANES III (Mexican) ★ NHANES III (Blacks) □ NHANES III (Whites)

Figure 1-3. Mean Systolic Blood Pressure
Hispanic Americans Aged 18 Years and Over, Part II

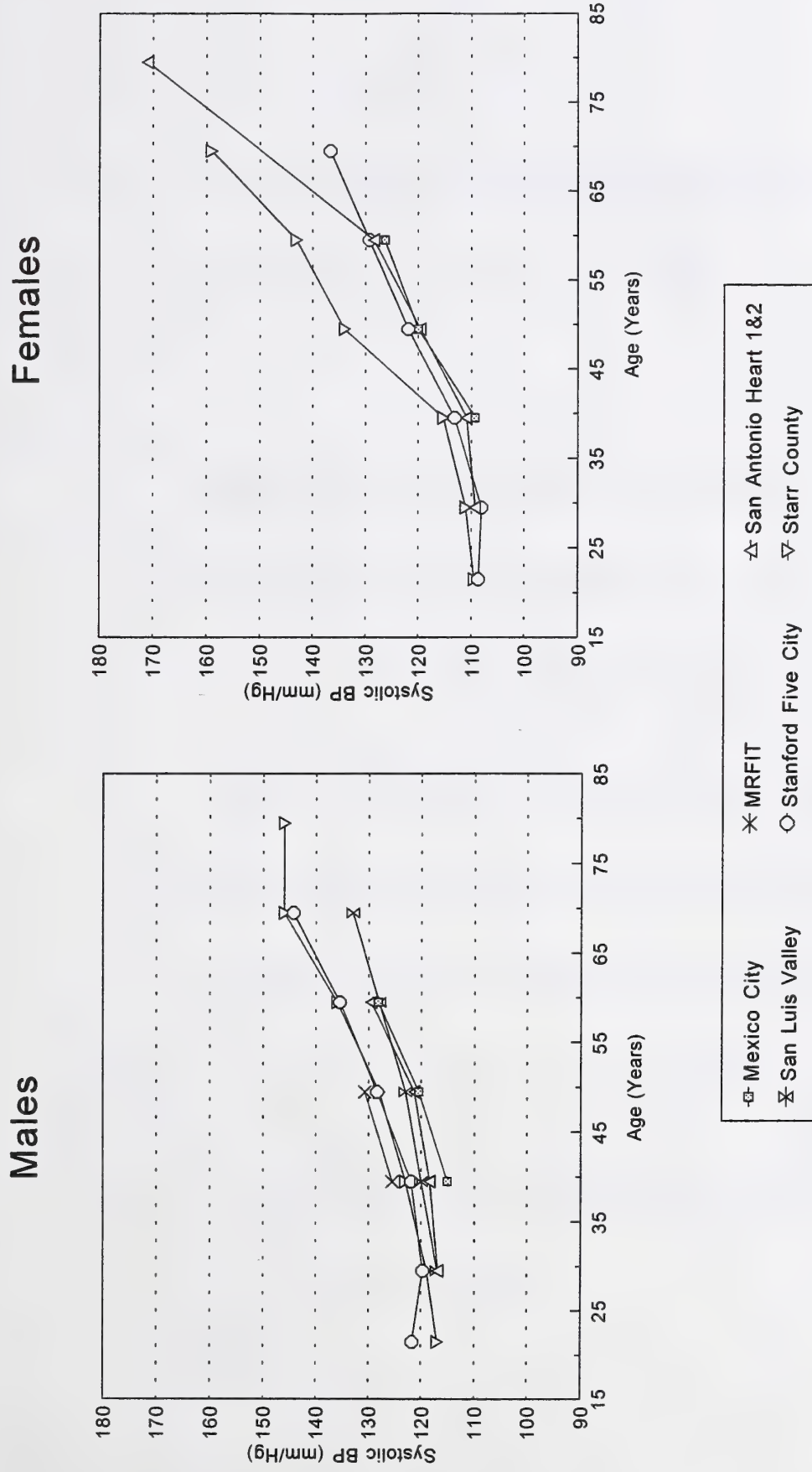


Figure 1-4. Mean Diastolic Blood Pressure

Hispanic Americans Aged 18 Years and Over, Part II

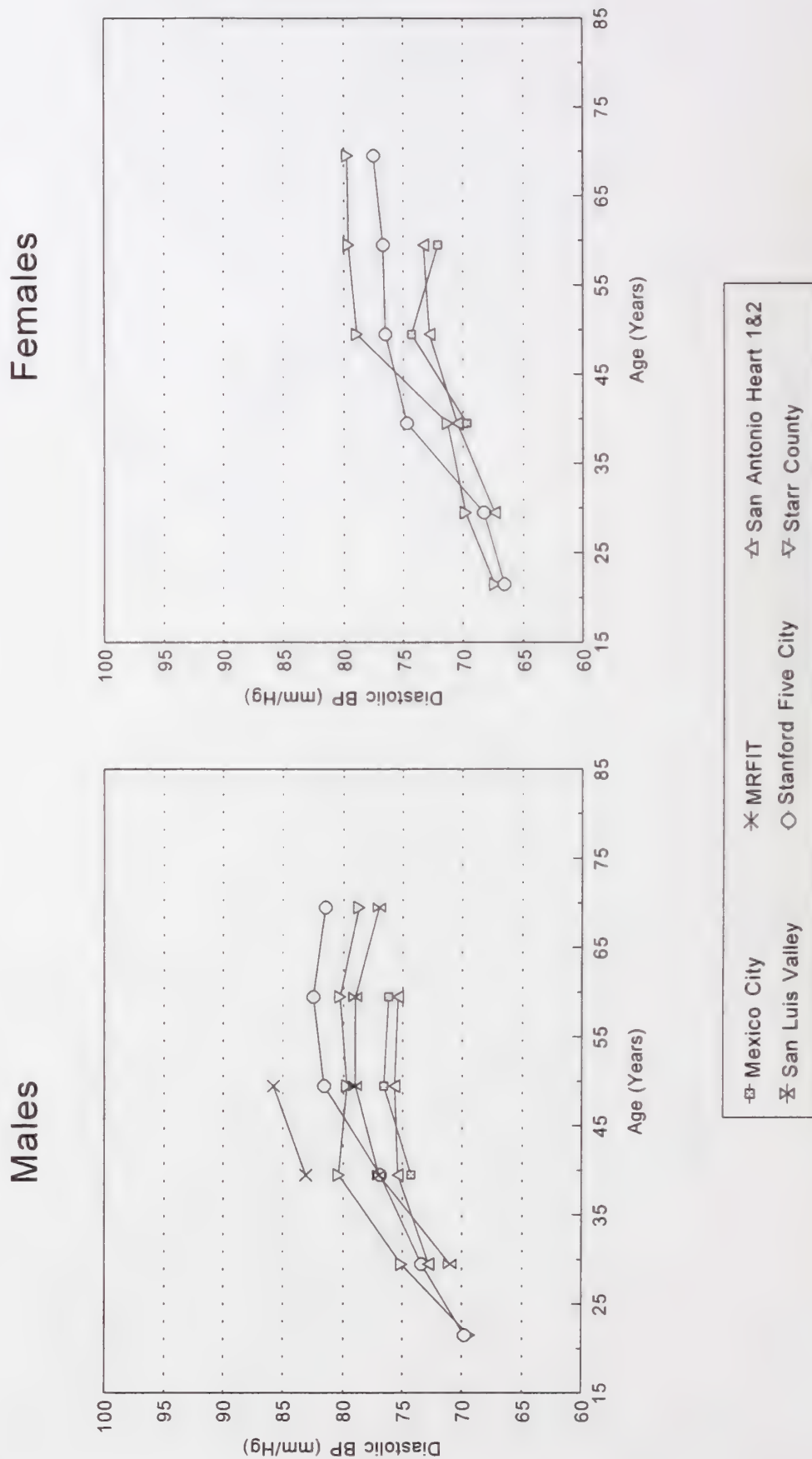


Figure 1-5. Mean Systolic Blood Pressure
Hispanic American Males and Females Aged 45-64 Years
 Age Adjusted to 1990 U.S. Resident Population

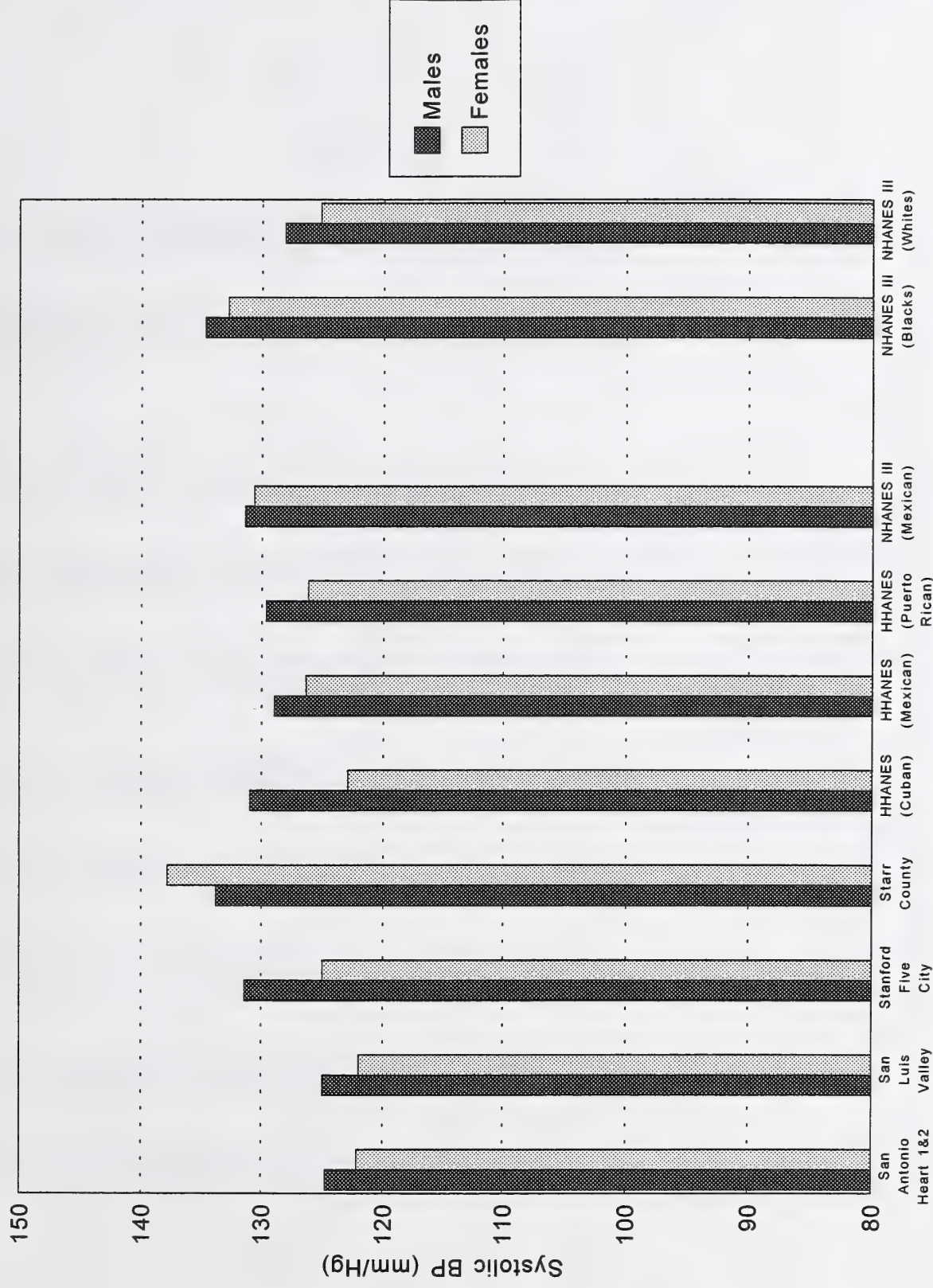


Figure 1-6. Mean Diastolic Blood Pressure
Hispanic American Males and Females Aged 45-64 Years
 Age Adjusted to 1990 U.S. Resident Population

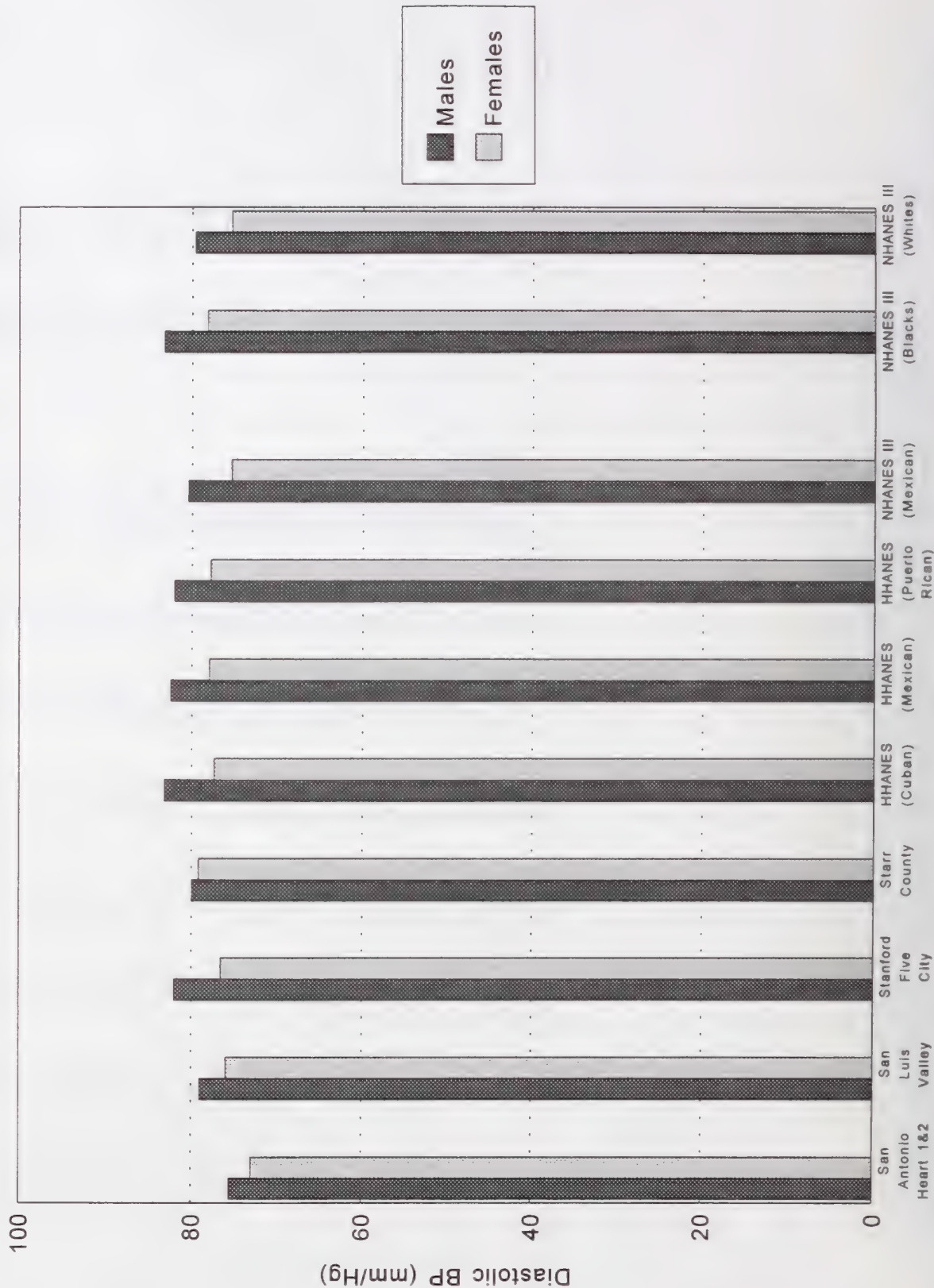
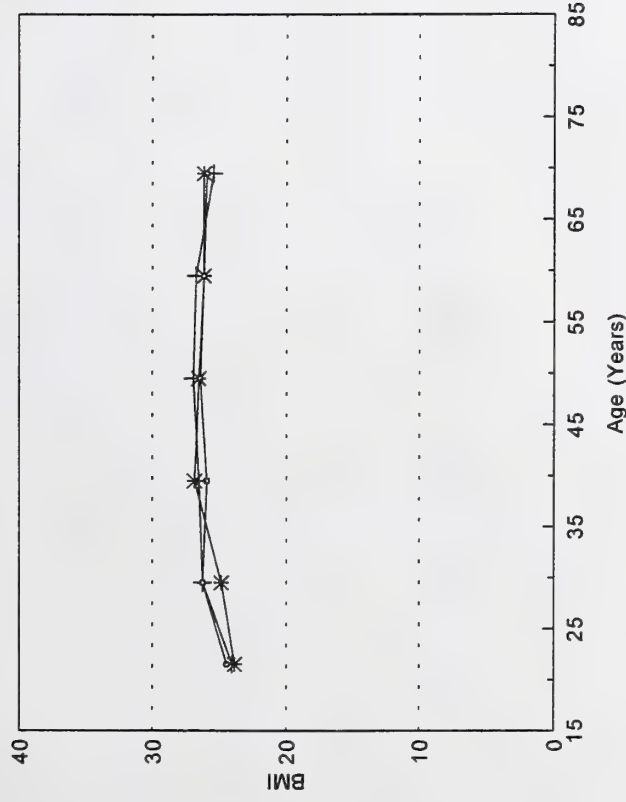


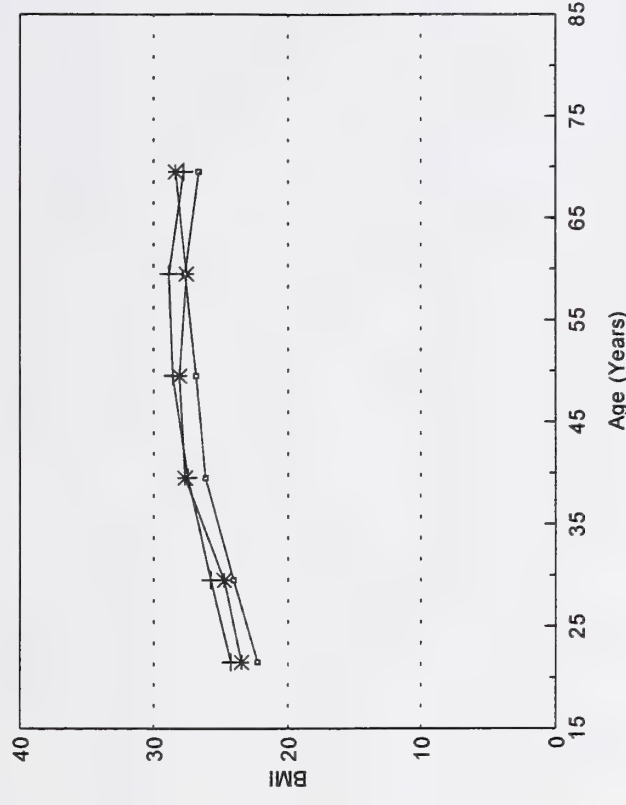
Figure 1-7. Mean Body Mass Index

Hispanic Americans Aged 18 Years and Over, Part I

Males



Females

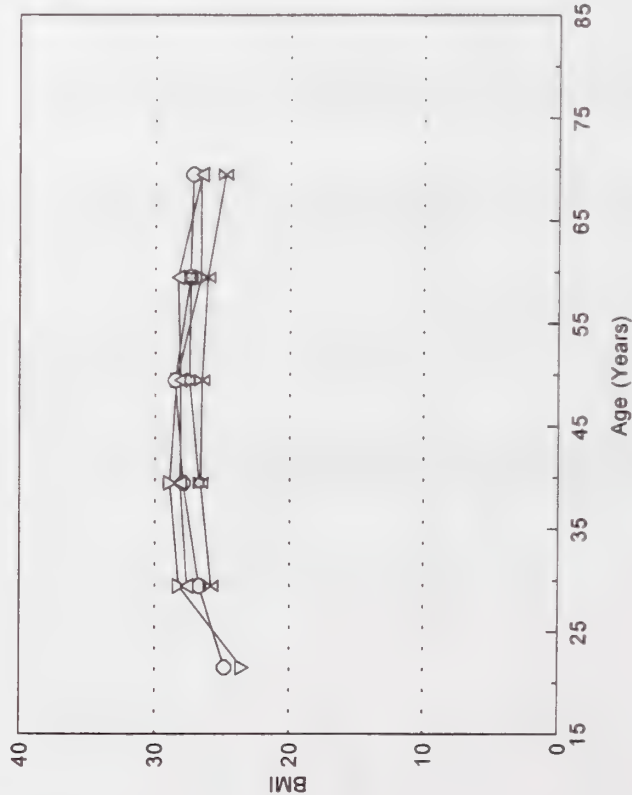


—□— HHANES (Puerto Rican)
—+— HHANES (Puerto Rican)
—*— HHANES (Puerto Rican)

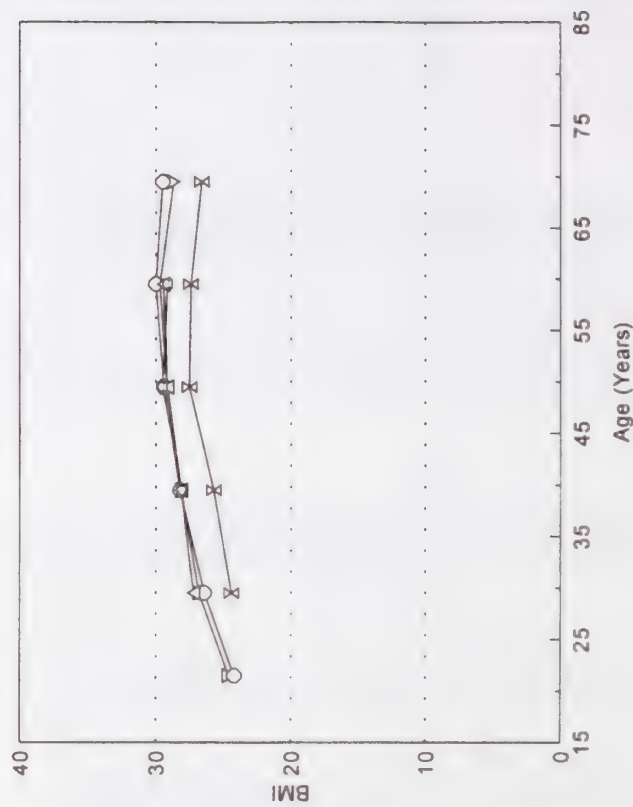
Figure 1-8. Mean Body Mass Index

Hispanic Americans Aged 18 Years and Over, Part II

Males

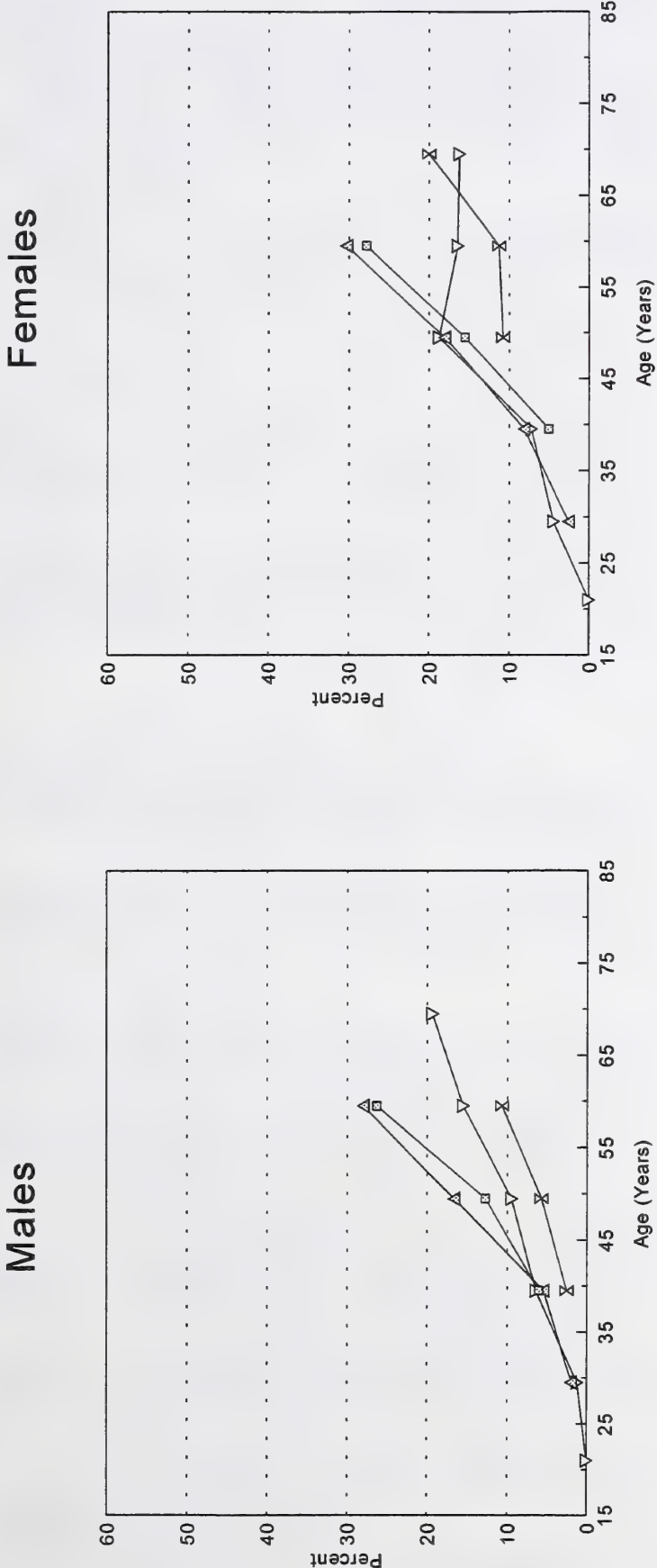


Females



□ Mexico City △ San Antonio Heart 1&2 ✕ San Luis Valley
 ○ Stanford Five City ▽ Starr County

Figure 1-9. Prevalence of Diabetes
Hispanic Americans Aged 18 Years and Over



Definition:

Diabetes: Fasting venous plasma glucose 140 mg/dl (greater or equal to 7.8 mM) or 2-hr. venous plasma glucose 200 mg/dl (greater or equal to 11.1 mM).

Source: WHO Study Group, Technical Report Series, Geneva, 1985.

- o- Mexico City
- △- San Antonio Heart 1&2
- x- San Luis Valley
- ▽- Starr County

Figure 1-10. Prevalence of Hypertension by Stage

Hispanic American Males and Females Aged 45-64 Years

Age Adjusted to 1990 U.S. Resident Population

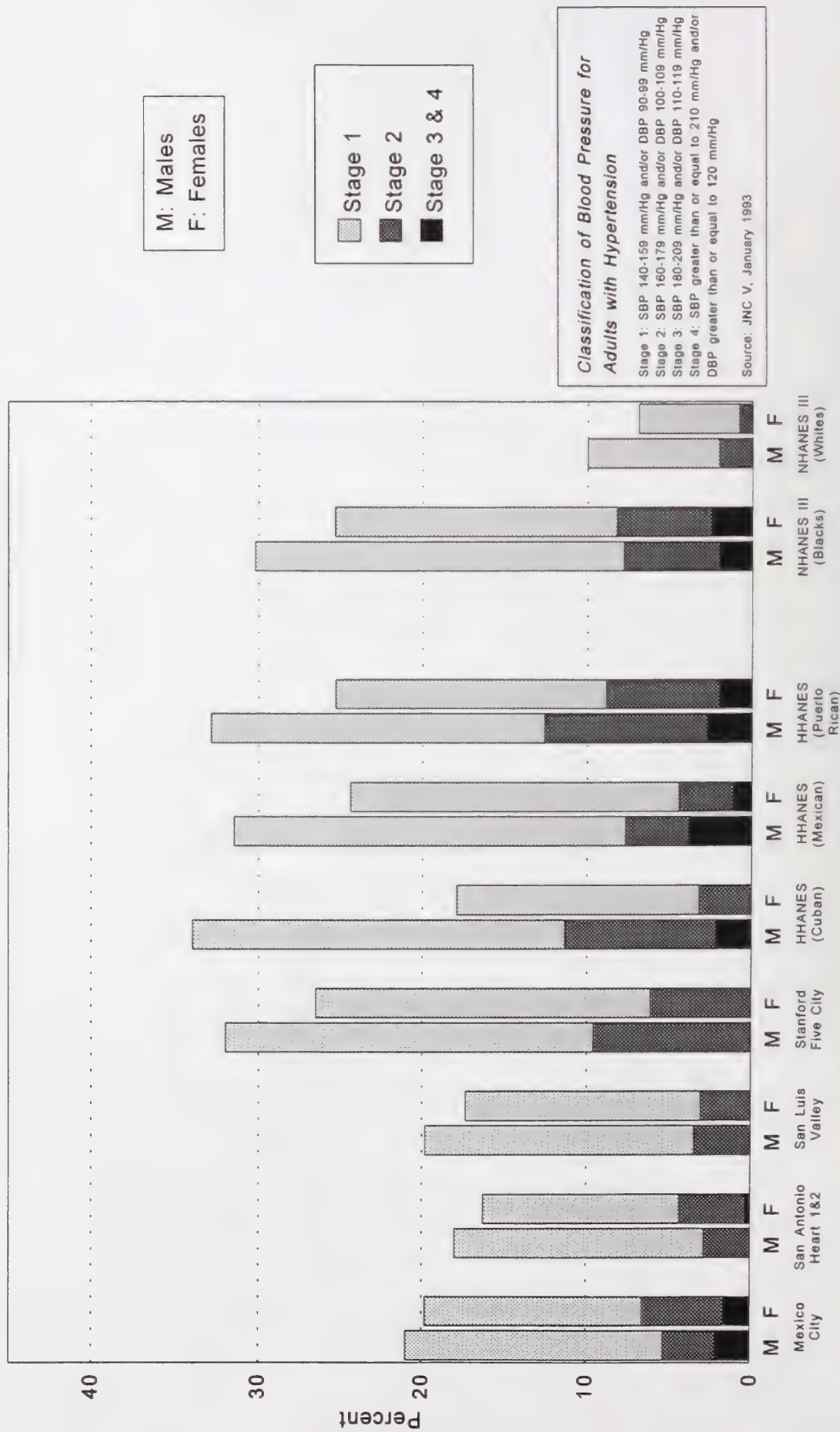
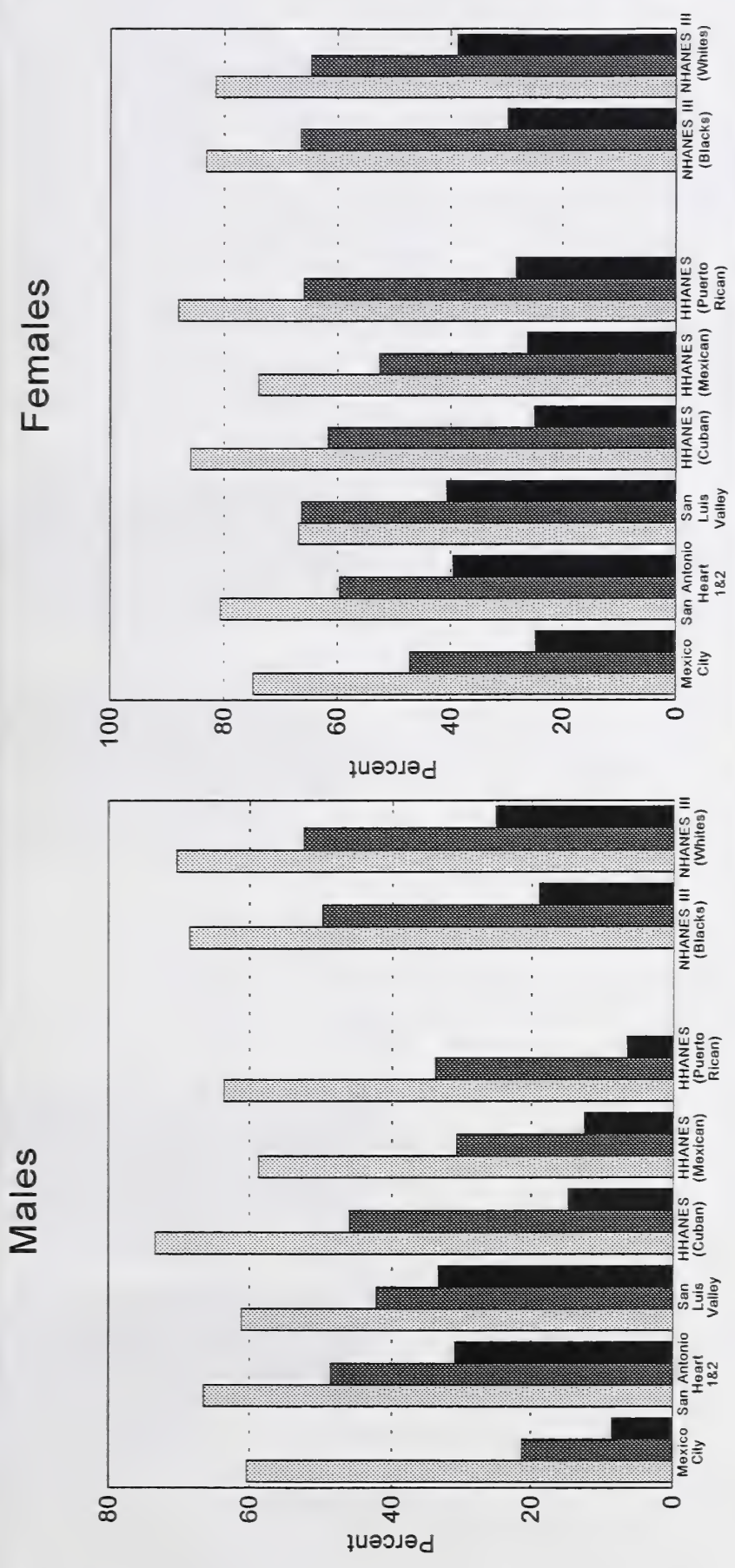


Figure 1-11. Awareness, Treatment, and Control of Hypertension
Hispanic Americans Aged 45-64 Years
 Age Adjusted to 1990 U.S. Resident Population



Definitions:

- Hypertension: SBP 140 mm/Hg or greater and/or DBP 90 mm/Hg or greater; or on an antihypertensive medication.
- Aware: Hypertensives told by physician.
- Treated: Hypertensives currently taking antihypertensive medication.
- Controlled: Hypertensives currently taking antihypertensive medication and SBP less than 140 mm/Hg and DBP less than 90 mm/Hg.

Source: JNC V, January 1993.

Figure 1-12. Prevalence of Hypertension by Glucose Tolerance

Hispanic Americans Aged 45-64 Years

Age Adjusted to 1990 U.S. Resident Population

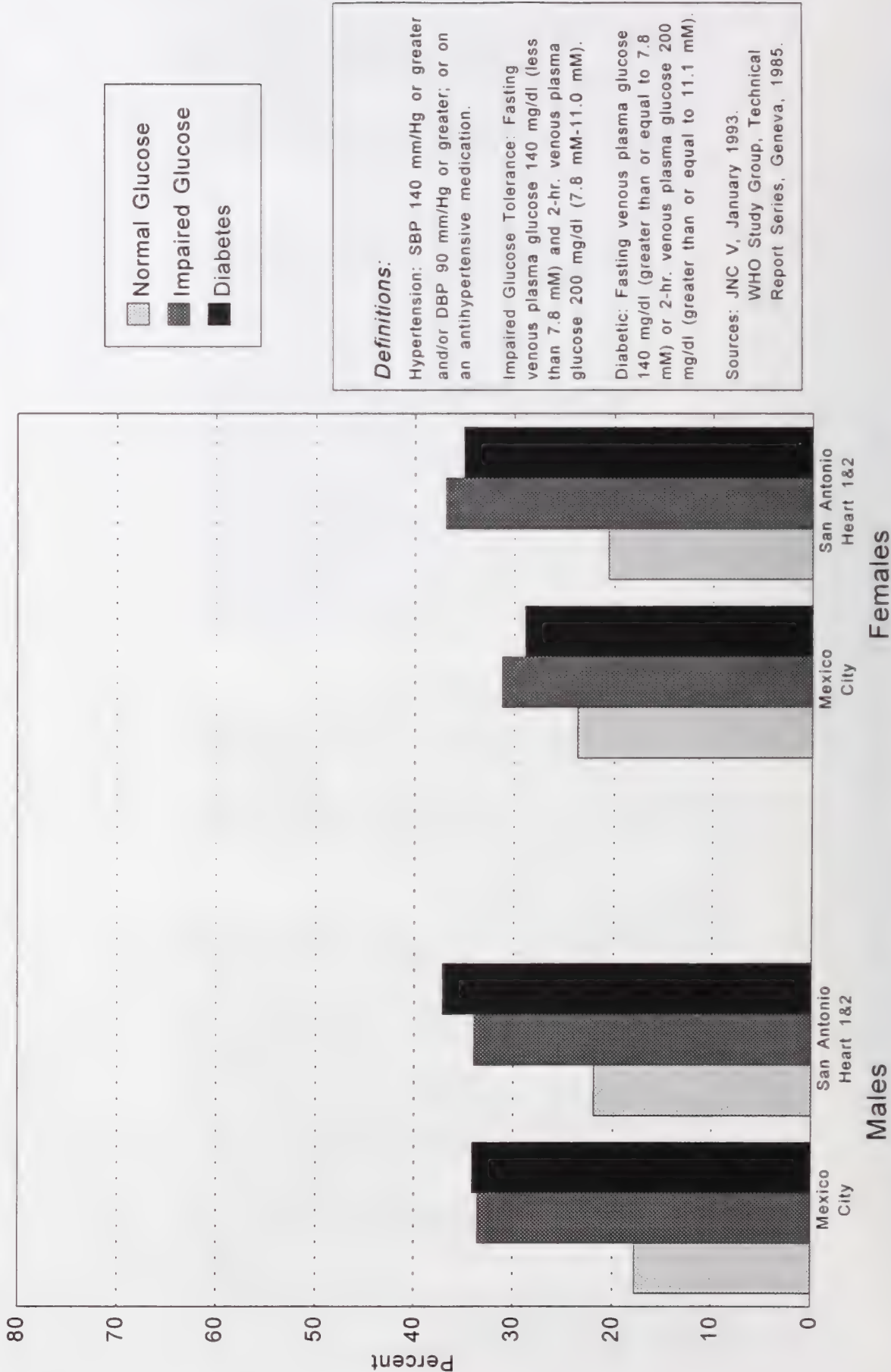


Figure 1-13. Mean Systolic Blood Pressure
Hispanic American Children Aged 3-18 Years

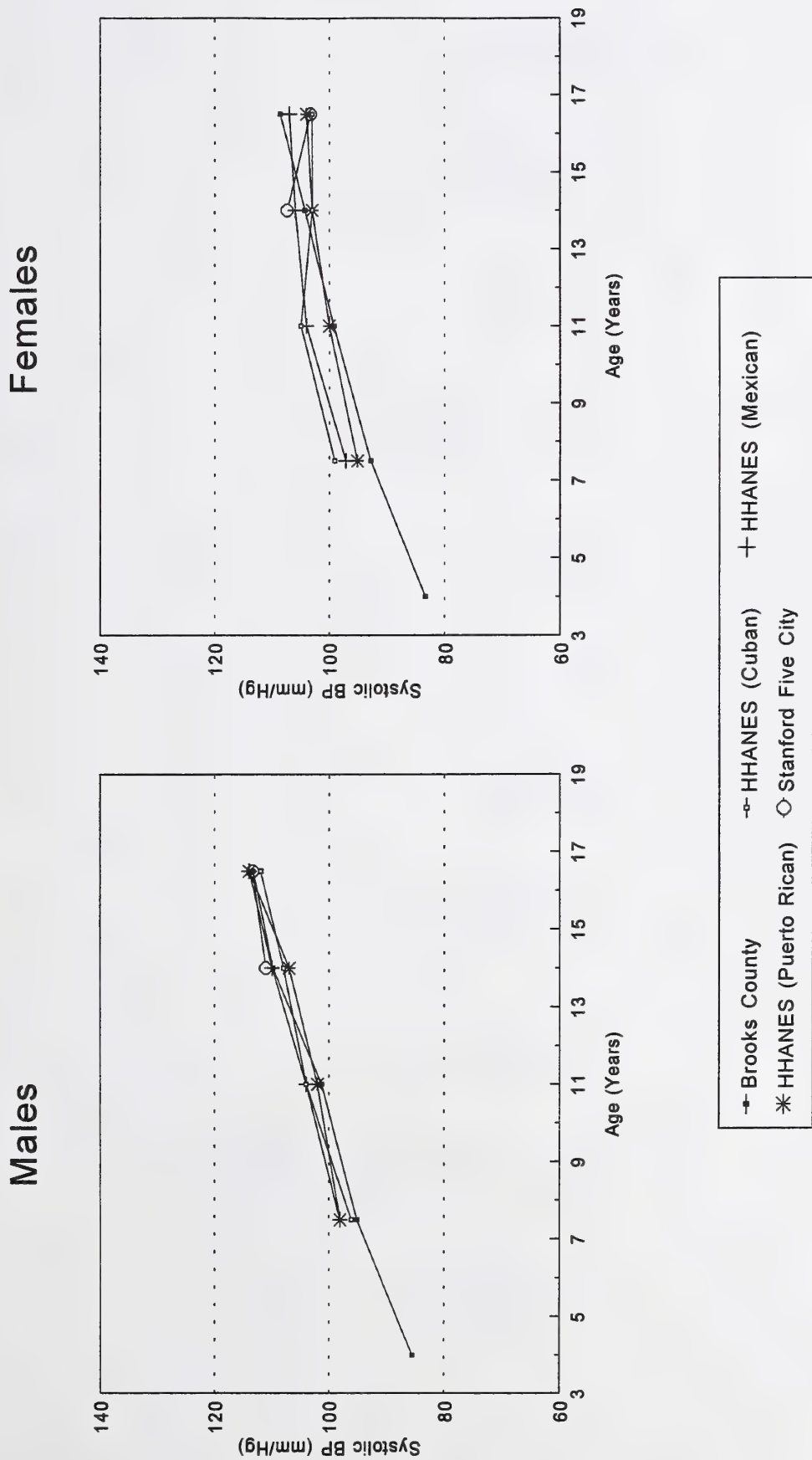


Figure 1-14. Mean Diastolic Blood Pressure

Hispanic American Children Aged 3-18 Years

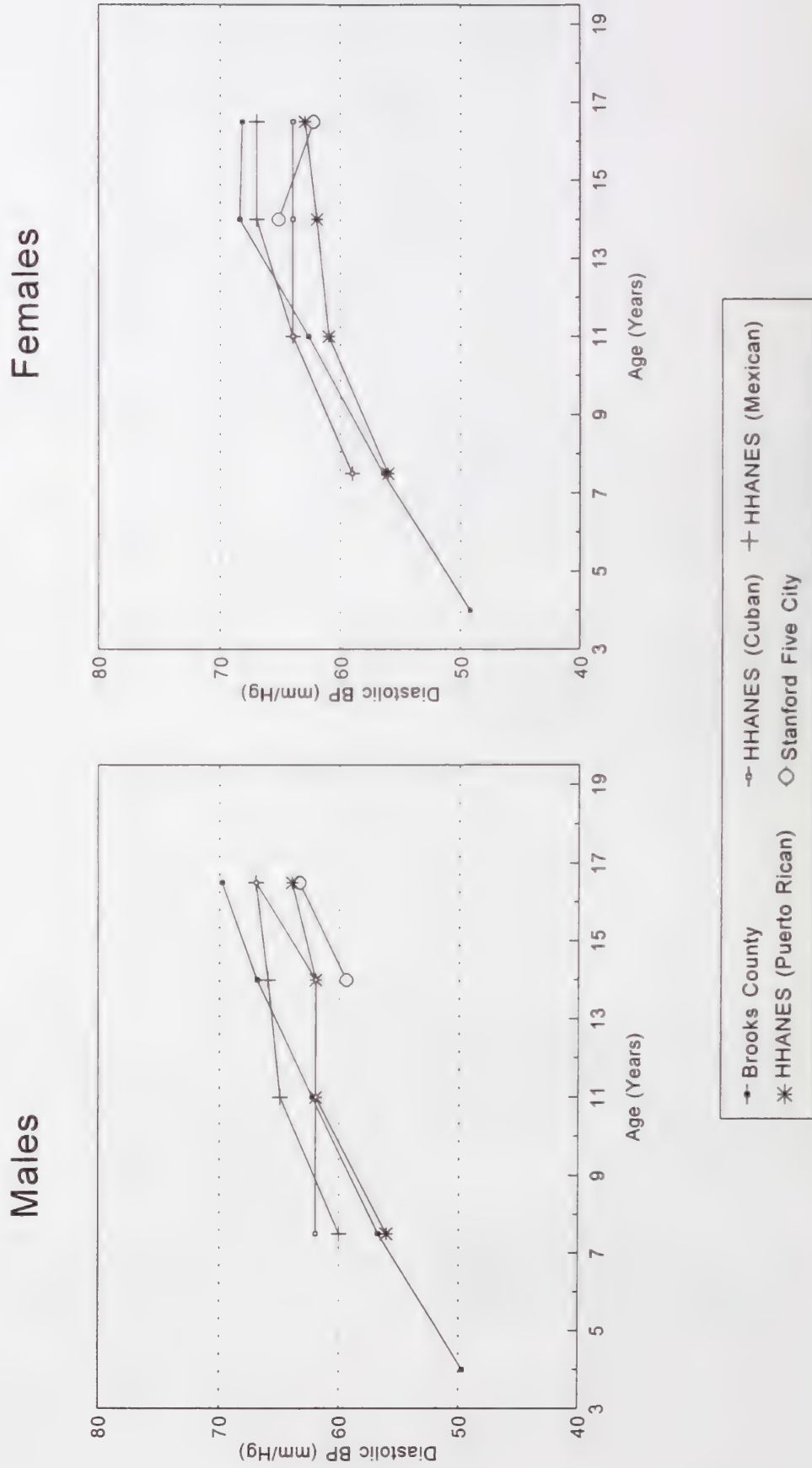
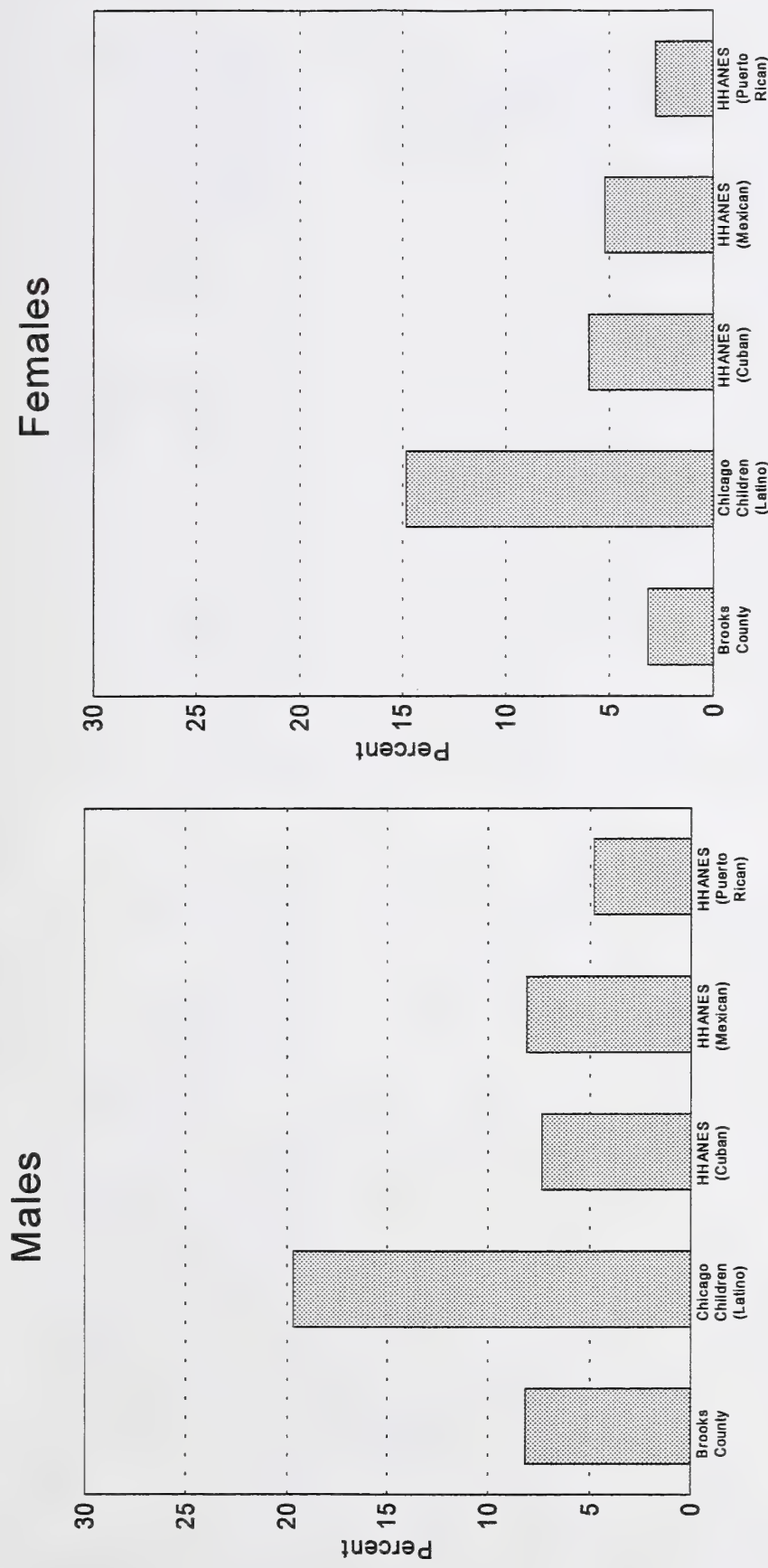


Figure 1-15. Prevalence of Blood Pressure Above the 90th Percentile
Hispanic American Children Age 3-18 Years



90th Percentile Cutpoints for Systolic and Diastolic Blood Pressure in Children.

Age 3-5:	SBP 108 mm/Hg and/or DBP 70 mm/Hg
Age 6-9:	SBP 114 mm/Hg and/or DBP 74 mm/Hg
Age 10-12:	SBP 122 mm/Hg and/or DBP 78 mm/Hg
Age 13-15:	SBP 130 mm/Hg and/or DBP 80 mm/Hg
Age 16-18:	SBP 136 mm/Hg and/or DBP 84 mm/Hg

Source: JNC V, January 1993.

Section II. Hypertension in American Indians and Alaska Natives

Overview

The great diversity within the cohort of Americans who identify themselves as American Indian or Alaska Native makes difficult any discussion of the constituent groups as a whole. Members of the approximately 500 federally recognized tribes speak more than 200 distinct languages and are widely dispersed across the United States. Social, religious, and economic differences, as well, further confound comparison.¹⁰ The 1990 U.S. Census documented variation in educational attainment, employment rates, per capita income, poverty rates, and housing conditions across reservations.¹¹

On the whole, however, American Indian and Alaska Native populations share a number of adverse socioeconomic conditions with certain other U.S. minorities, including lower educational achievement, higher unemployment, and lower income, all of which have been associated with increased morbidity and mortality rates.¹² Slightly more than one-half of American Indians and Alaska Natives live in poverty. Many live on reservations where lack of transportation dominates their lives, negatively affecting access to health care as well as preventive efforts.¹³ Because of these impediments, a number of health conditions remain insufficiently addressed, despite the efforts of the Indian Health Service (IHS) to provide American Indians and Alaska Natives universal access to health care.¹²

The IHS provides health care services to members of federally recognized tribes who live on reservations or within contract health service delivery areas. Off-reservation members may receive health services through the IHS-supported urban health care projects or through Federal, State, or local

agencies, but some American Indians and Alaska Natives have no access to health care because they are ineligible or lack transportation to access the services.¹³

The American Indian and Alaska Native population is relatively young, with the estimated median age being 24.2 years compared to 32.9 years for the general U.S. population and 34.4 years for U.S. Whites. Only 5.7 percent of this group are age 65 years or older compared to 12.6 percent for all races in the United States.¹²

Despite the lack of access to health care noted above, remarkable improvement in the health of American Indian and Alaska Natives has occurred during the past 40 years, with the notable exceptions of heart disease, cancer, and diabetes. However, age-specific mortality rates for this population under age 60 years remain higher than those for the general population. Although the mortality rate for heart disease is somewhat less than that for the general population, it is now the leading cause of death of American Indian and Alaska Natives.¹²

Earlier studies reported relatively low prevalence of hypertension in non-diabetic American Indian and Alaska Natives. Today, however, the incidence is increasing: Hypertension accounts for 4.2 percent of all IHS ambulatory visits, exceeded only by upper respiratory infections, otitis media, and diabetes. An important aspect of hypertension among American Indian and Alaska Natives is its strong association with diabetes and the apparent synergistic increase in morbidity when the two occur together.¹²

Study Descriptions

The following are descriptions of the studies included in this section. Each description provides a brief overview of an individual study's timeframe, sample, design, and primary objectives. Although this section focuses on data from the American Indian and Alaska Native populations, the descriptions provided may refer to a study's larger, overall population and study design. A more detailed explanation of the study design and findings may be found within the references following each study description.

A shortened study name is enclosed within parentheses following the name of each study. These are used in place of the longer study names on all figures and tables.

The Indian Health Service Study (Indian Health Service)

The Indian Health Service study examined the prevalence of clinically diagnosed hypertension among all American Indian and Alaska Native outpatients served in IHS facilities across the United States for fiscal year 1992, compared these rates with a similar analysis done in 1987, and reported data on the association between hypertension and diabetes. The data set represented 60 percent of the 1.3 million American Indian and Alaska Native population served by the IHS. The information presented here is a refined analysis of data from the seven Indian reservations in Montana and Wyoming. Data from outpatient visits from October 1991 to September 1992 were examined to identify individuals with diagnoses of hypertension and/or diabetes.

References:

Acton KJ, Preston S, Rith-Najarian S. Clinical Hypertension in Native Americans: a comparison of 1987 and 1992 rates from ambulatory care data. Public Health Reports, submitted.

Broussard BA, Valway SE, Kaufman S, et al. Clinical hypertension and its interaction with diabetes among American Indians and Alaska Natives. Diabetes Care. 1993;16(1):292-6.

The Multiple Risk Factor Intervention Trial (MRFIT)

The Multiple Risk Factor Intervention Trial (MRFIT) screening team examined 361,662 men aged 35 to 57 years living in the contiguous United States. The screening took place in 22 clinical centers between 1973 and 1975. Participants identified themselves as "White," "Black," "Oriental," "Spanish-American," "American Indian," or "Other." Since the study was designed only to identify men eligible for the trial, no effort was made to obtain a representative sample of any defined population. The study provided, however, an opportunity to compare relatively large numbers of these ethnic groups with Whites.

While the study did not seek to obtain a representative sample of any defined population, it is considered a significant study of blood pressure levels in U.S. minority populations. For this section, MRFIT data on American Indian and Alaska Natives were extracted from the original aggregated data and are presented here with data from other studies of the prevalence of hypertension in American Indian and Alaska Natives.

References:

The multiple risk factor intervention trial (MRFIT). A national study of primary prevention of coronary heart disease. JAMA. 1976 Feb 23;235(8):825-7.

Statistical design considerations in the NHLI multiple risk factor intervention trial (MRFIT). The Multiple Risk Factor Intervention Trial Group. J Chron Dis. 1977 May;30(5):261-75.

The Navajo Adolescent Study (Navajo Adolescent)

The Navajo Adolescent study is a two-part study. The first is a school-based survey conducted in the northeastern corner of the Navajo Indian Reservation during 1989 to 1991. Four secondary schools, with 481 children aged 13 to 18 years from different parts of the reservation, were asked to participate in a survey to assess body weight, blood pressure, and dietary practices of Navajo adolescents. The second data set resulted from a large reservation-wide, population-based study of the prevalence of selected chronic diseases and related risk factors among adolescents and adults carried out in 1990 to 1992. (See description of the Navajo Health and Nutrition Study that follows.) The Navajo Adolescents study assesses the proportion of Navajo adolescents with high normal blood pressure, and examines the relationship between blood pressure and anthropometric measurements.

Reference:

Gilbert TJ, Percy CA, Sugarman JR, et al. Obesity among Navajo adolescents. Relationship to dietary intake and blood pressure. Am J Dis Child. 1992 Mar;146(3):289-95.

The Navajo Health and Nutrition Study (Navajo Health & Nutrition)

The Navajo Health and Nutrition study staff reviewed the 1990 to 1992 medical records of 743 Navajo Indians diagnosed as hypertensive at the Shiprock Public Health Service Hospital, Shiprock, New Mexico. The study also included interviews conducted in homes randomly selected through a multistage probability sampling strategy. The purpose of the study was to evaluate the relationship between the level of long-term blood pressure control and the occurrence of serious medical complications, including stroke, coronary artery disease, congestive heart failure, diabetes mellitus, myocardial infarction, and renal failure.

Reference:

White LL, Gilbert TJ. Navajo health and nutrition survey training and protocol manual. Indian Health Service, Window Rock, AZ, nd.

The Pima Indian Study (Pima Indians)

Between 1973 and 1986, 2,873 Pima Indians aged 18 to 92 years were examined approximately every 2 years as part of a continuing longitudinal epidemiological study of non-insulin-dependent diabetes mellitus (NIDDM). Only men and women who were at least 50 percent Pima, Tohono-O'odham (Papago), or a mixture of these closely related tribes were included in the study. Examinations included a medical history relating diabetes and other major health problems (including hypertension and current drug treatment). Researchers examined relationships among blood pressure, obesity, glucose tolerance, and serum insulin concentration.

References:

Bennett PH, Burch TA, Miller M. Diabetes mellitus in American (Pima) Indians. *Lancet*. 1971;2:825-8.

Saad MF, Knowler WC, Pettitt DJ, et al. Insulin and hypertension: relationship to obesity and glucose intolerance in Pima Indians. *Diabetes*. 1990 Nov;39(11):1430-5.

The St. Lawrence Island Study (St. Lawrence Island)

For this pilot study, 70 Siberian Yupik Eskimo residents of St. Lawrence Island, Alaska, age 40 years and older were recruited in September 1992. The sample represented 57 percent of the population in this age group. The protocol from the Strong Heart Study was followed, and the same laboratory was utilized for the blood chemistry. Nutritional data were obtained from all subjects, as well as other measurements, including fasting insulin and lipoproteins, body mass index, electrocardiogram and blood pressure. The purpose of the study was to look at the prevalence of hypertension, non-insulin-dependent diabetes mellitus, and insulin glucose tolerance.

Reference:

Schraer CD, Ebbesson S, Adler AI, et al. Glucose intolerance and insulin resistance syndrome among St. Lawrence Island Eskimos. *Western Medicine*, submitted.

The Strong Heart Study (Strong Heart)

The Strong Heart study examined cardiovascular disease in American Indians using a standardized protocol in several geographic regions (Arizona, Oklahoma, and North and South Dakota). The study had three components: 1) a mortality survey to estimate the cardiovascular disease death rate; 2) a morbidity survey to estimate incidence of both first and/or recurrent hospitalized myocardial infarction and stroke; and 3) a clinical examination including a personal interview, a physical examination, and laboratory tests to estimate the prevalence of cardiovascular disease and its risk factors. Men and women between the ages of 35 and 74 years in 1984 to 1988 were recruited for the mortality survey; men and women between the ages of 45 and 74 years in 1984 to 1988, for the morbidity survey; and men and women between the ages of 45 and 74 years in 1989 to 1991, for the clinical examination.

References:

Lee ET, Welty TK, Fabsitz R, et al. The Strong Heart Study: a study of cardiovascular disease in American Indians: design and methods. *Am J Epidemiol*. 1990;132(6):1141-55.

National Heart, Lung, and Blood Institute. The Strong Heart Study Manual. Oklahoma City, OK: The Strong Heart Study Coordinating Center, University of Oklahoma Health Sciences Center, 1989.

Welty TK, Lee ET, Yeh J, et al. Cardiovascular disease risk factors among American Indians: the Strong Heart Study. *Am J Epidemiol*. 1995;142:269-87.

Table 2-1 Study Design Summary American Indian and Alaska Native Studies						
Study	Ethnic Group/Subgroup	Ages (years)	Sample Size	Location	Study Dates	
Indian Health Service	American Indian and Alaska Native	15-65+	23,038	MT, WY	1991-92	
MRFIT	American Indian	35-57	314	FL, NY, CA	1973-75	
Navajo Adolescent	Navajo	13-18	481	Navajo Indian Reservation	1989-92	
Navajo Health & Nutrition	Navajo	12+	743	Navajo Reservation in NM, AZ, UT	1990-92	
Pima Indians	At least 50%: Pima, Tohono-O'odham (Papago), or a mixture of these closely related tribes	5-75+	5,000	Gila Indian River Community, AZ	1972-94	
St. Lawrence Island	Yupik Eskimo	40+	70	St. Lawrence Island, AK	Sept. 1992	
Strong Heart	Gila River and Salt River Pima/Maricopa, AK Chin Pima/Papago, Apache, Caddo, Comanche, Delaware, Fort Sill Apache, Kiowa, Wichita, Oglala Sioux, Cheyenne River Sioux, Devil's Lake Sioux	45-74	4,549	OK, SD, AZ, ND	1989-91	

<p>Table 2-2 Blood Pressure Measurement Protocols American Indian and Alaska Native Studies</p>				
Study	Random Zero Sphygmomanometer Used	Number of Readings	Readings Used	Participant Position
Indian Health Service	Yes	3	All	Seated
MRFIT	No	3	2nd and 3rd	Seated
Navajo Adolescent	Yes	2	1st and 2nd	Seated
Navajo Health & Nutrition	Yes	3	2nd and 3rd	Seated
Pima Indians	No	1	N.A.*	Supine
St. Lawrence Island	No	3	2nd and 3rd	Seated
Strong Heart	No	3	2nd and 3rd	Seated

* Information not available.

Figure 2-1. Mean Systolic Blood Pressure

American Indians Aged 18 Years and Over

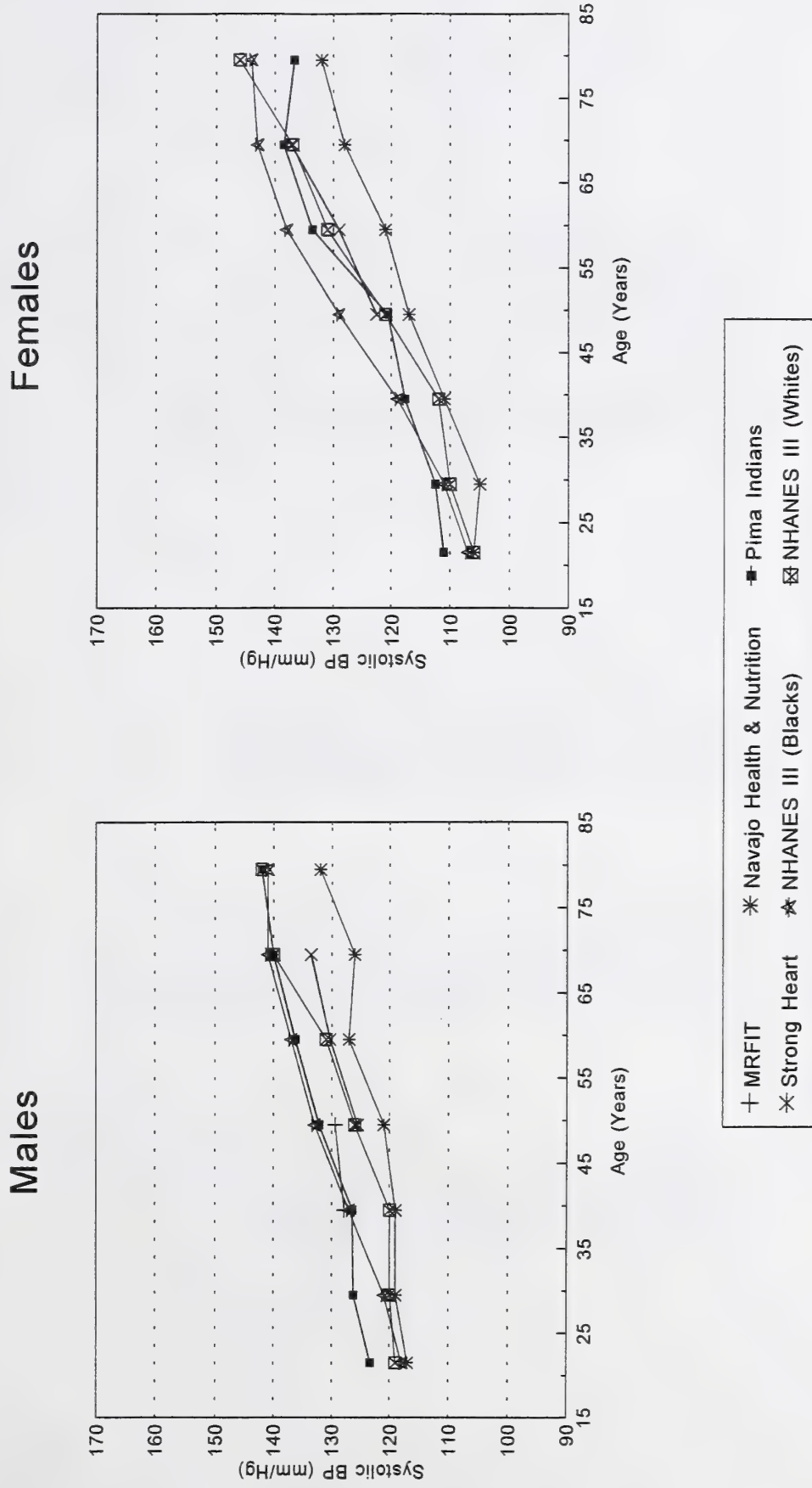


Figure 2-2. Mean Diastolic Blood Pressure American Indians Aged 18 Years and Over

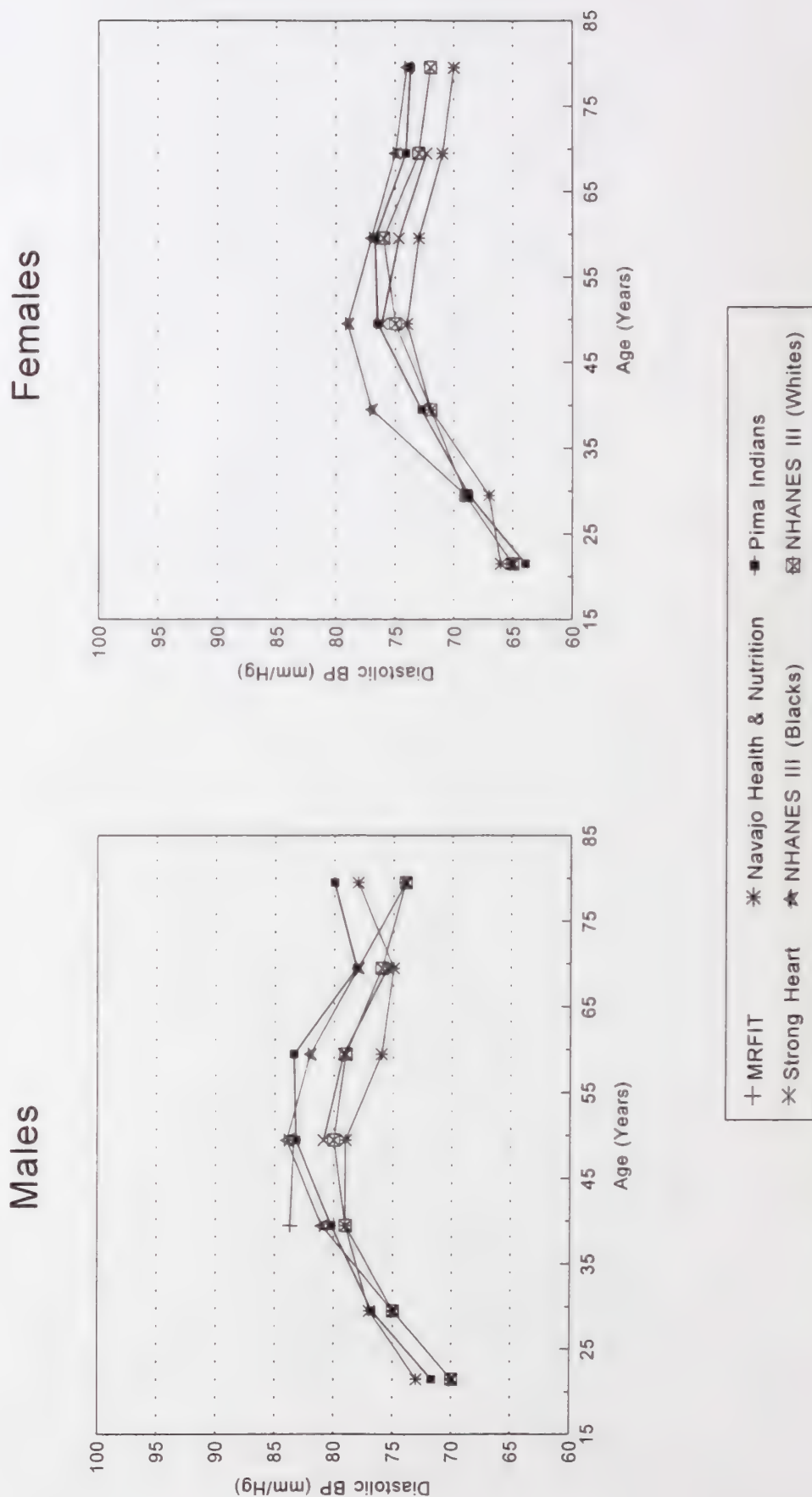


Figure 2-3. Mean Systolic Blood Pressure
American Indian Males and Females Aged 45-64 Years
 Age Adjusted to 1990 U.S. Resident Population

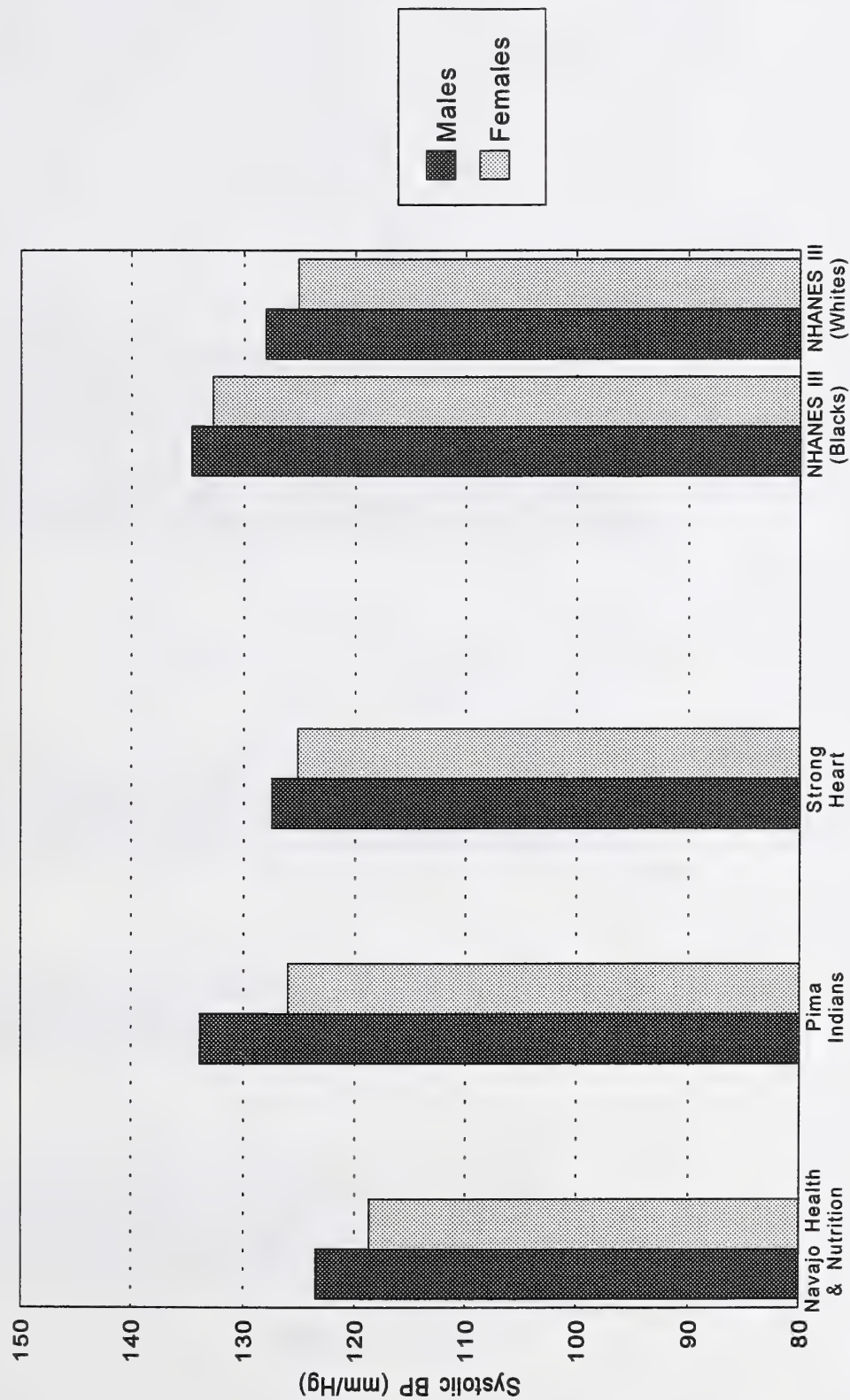


Figure 2-4. Mean Diastolic Blood Pressure
American Indian Males and Females Aged 45-64 Years
 Age Adjusted to 1990 U.S. Resident Population

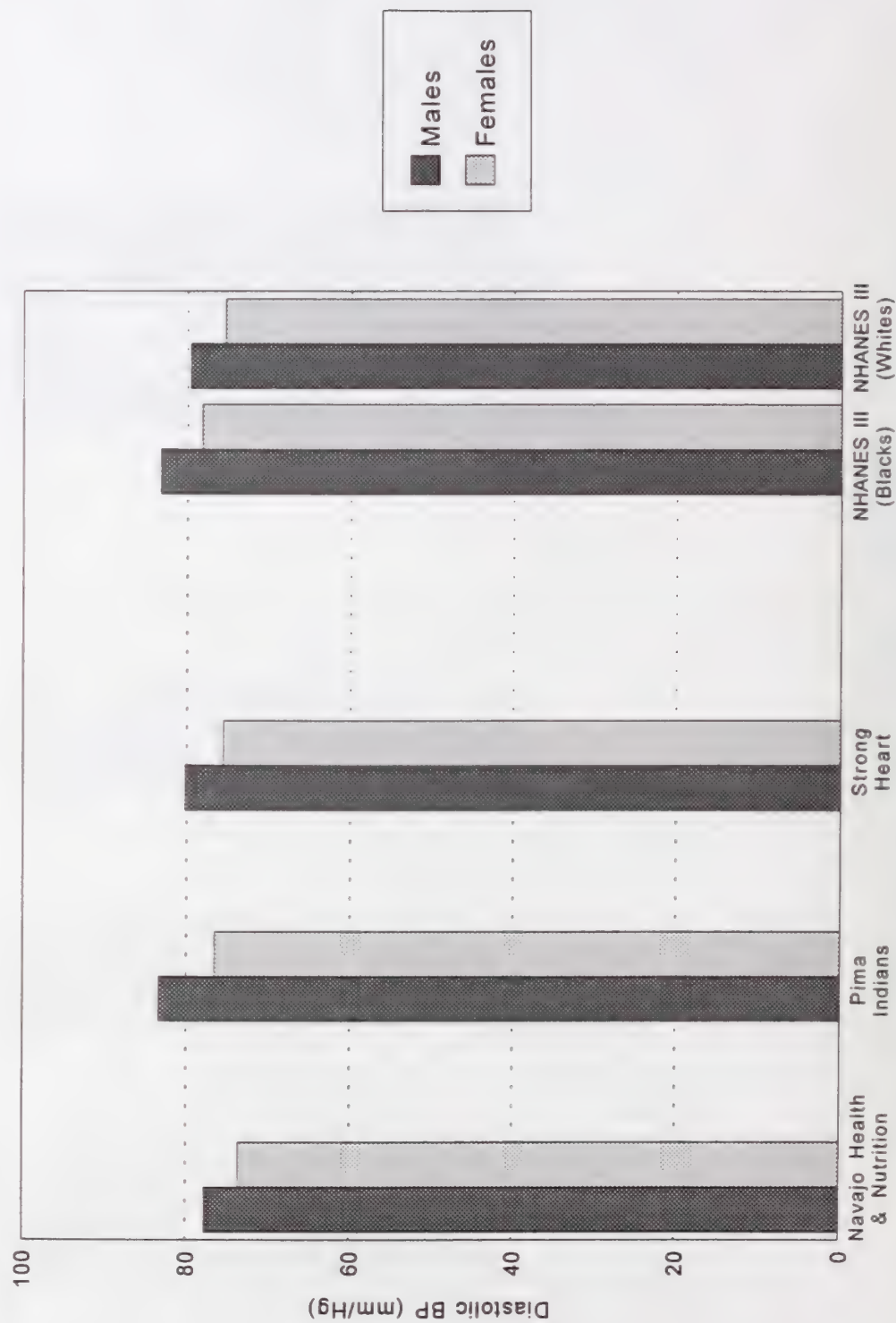


Figure 2-5. Mean Systolic Blood Pressure

Yupik Eskimos Aged 18 Years and Over

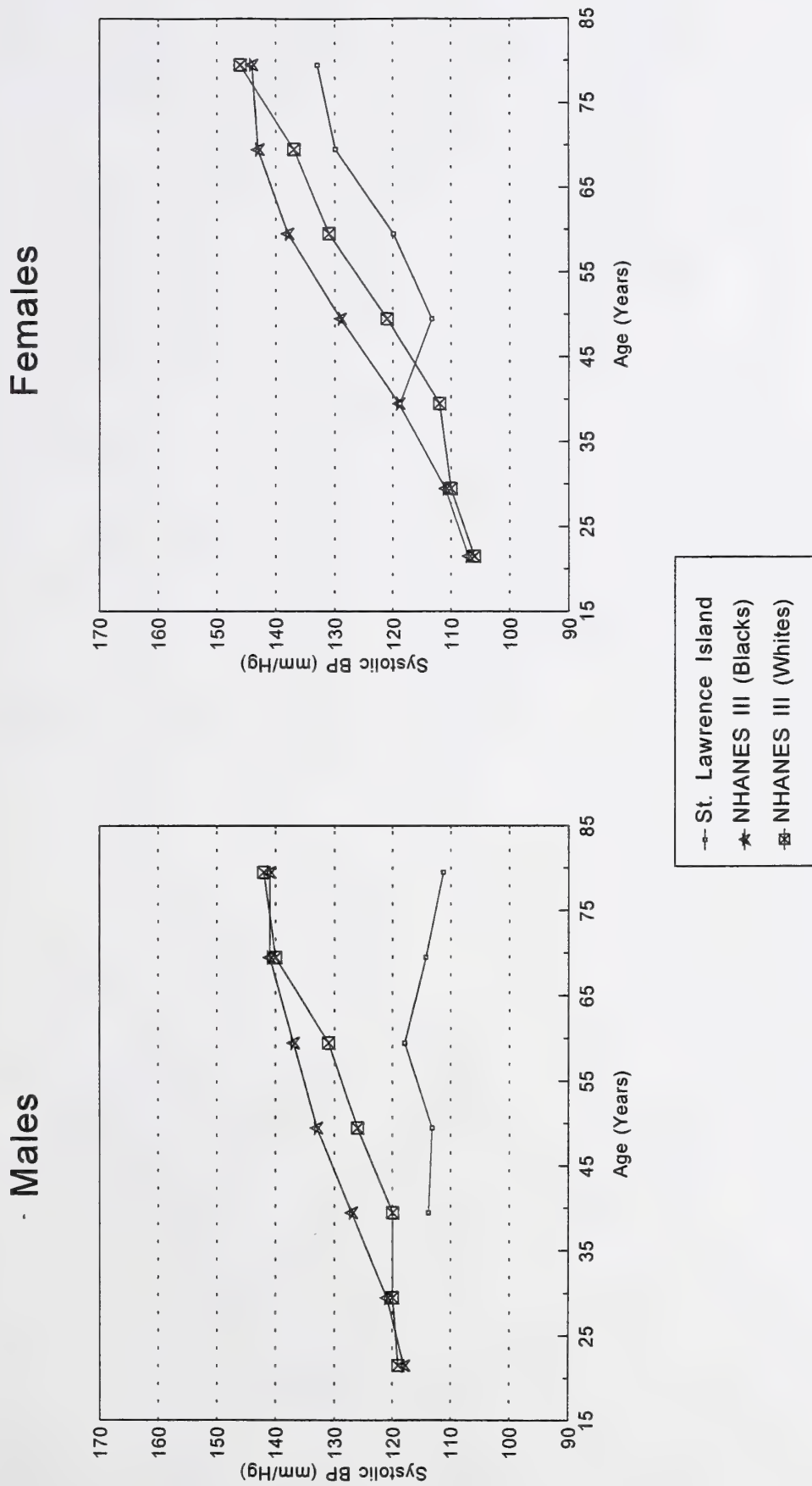
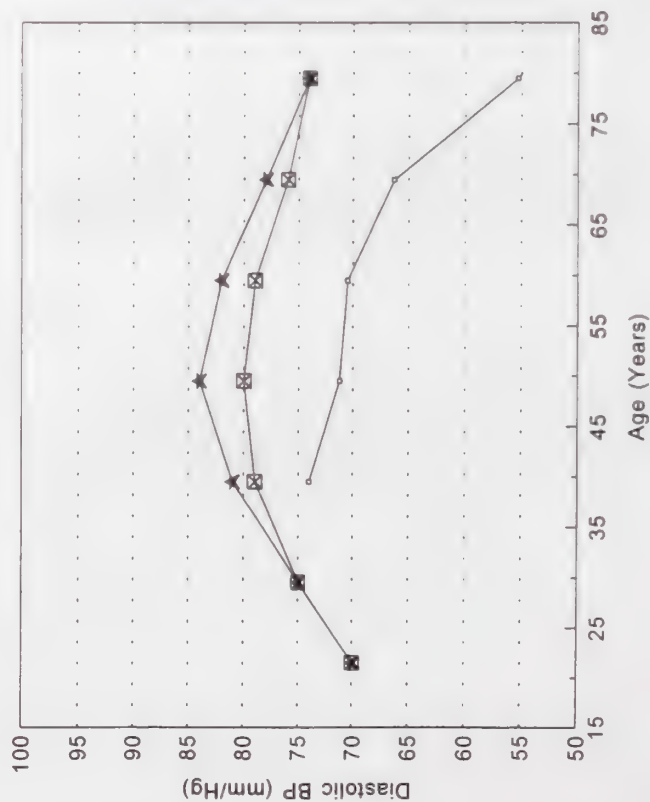


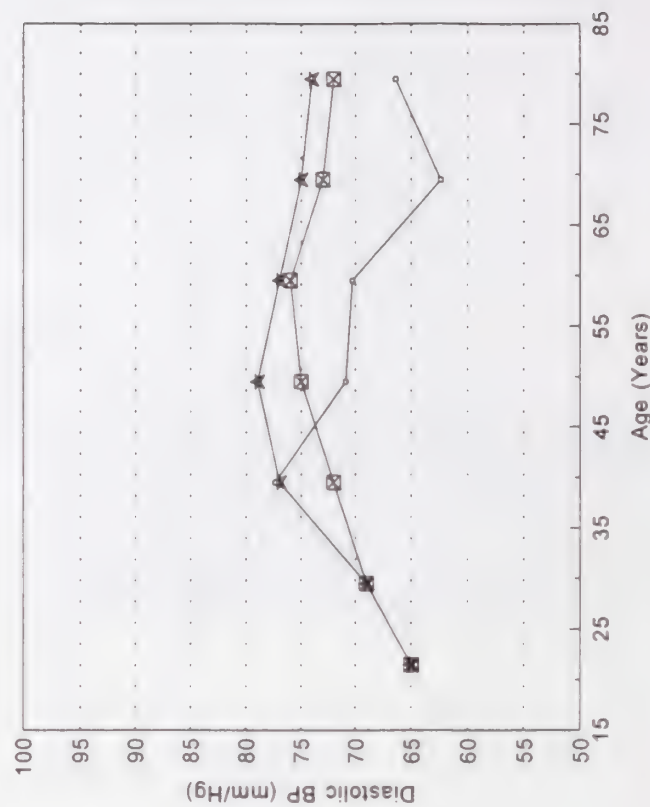
Figure 2-6. Mean Diastolic Blood Pressure

Yupik Eskimos Aged 18 Years and Over

Males



Females



- St. Lawrence Island
- NHANES III (Blacks)
- NHANES III (Whites)

Figure 2-7. Mean Body Mass Index

American Indians Aged 18 Years and Over

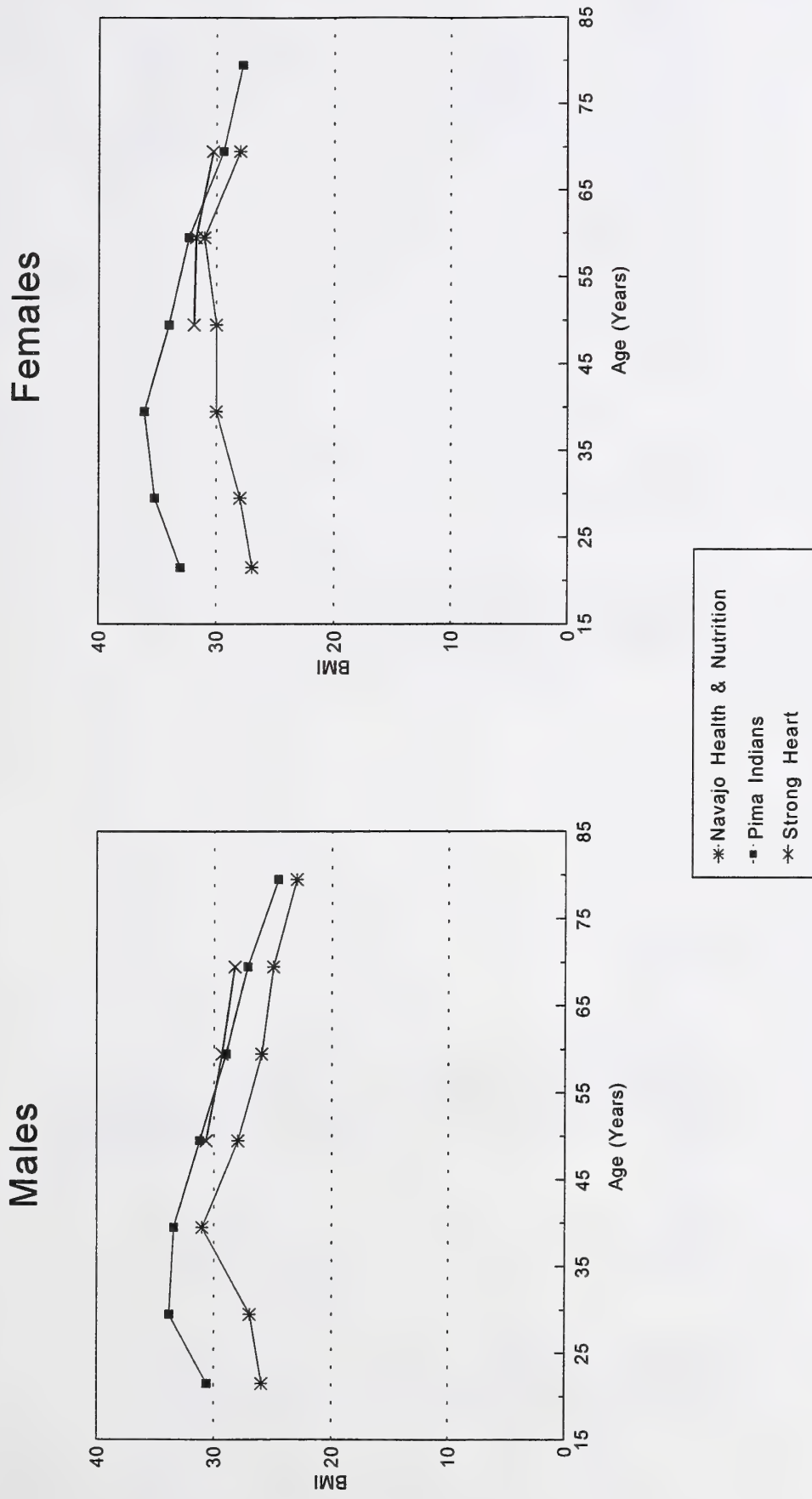
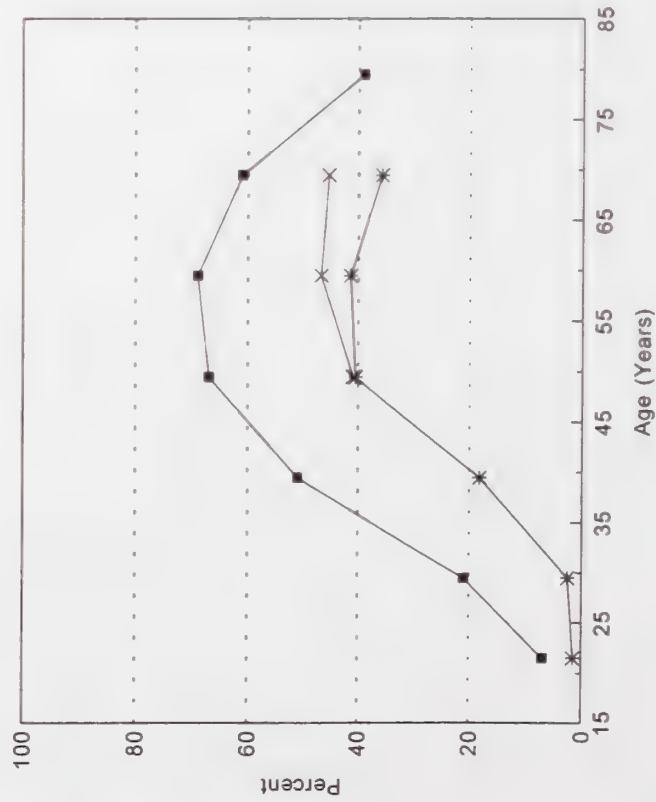


Figure 2-8. Prevalence of Diabetes

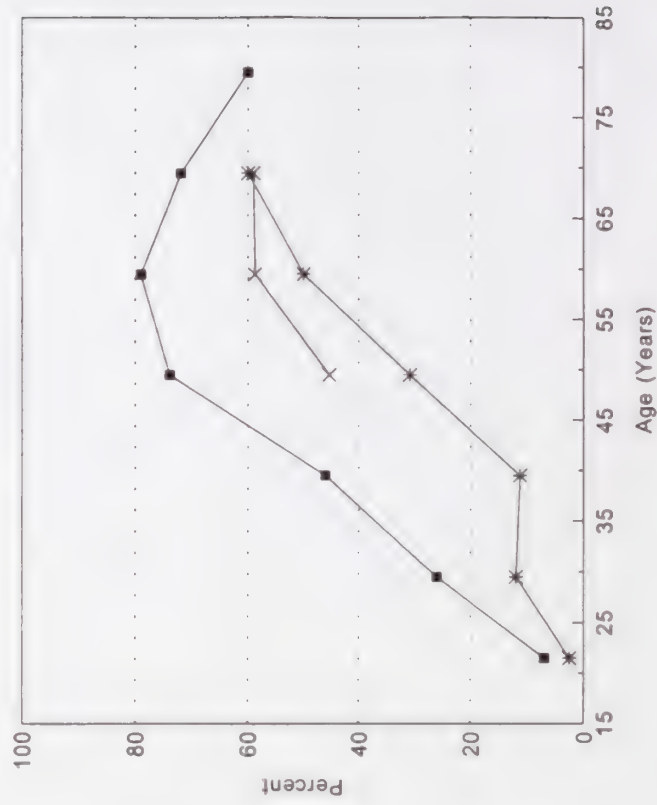
American Indians Aged 18 Years and Over

Males



* Navajo Health & Nutrition
 ■ Pima Indians
 x Strong Heart

Females



Definition:

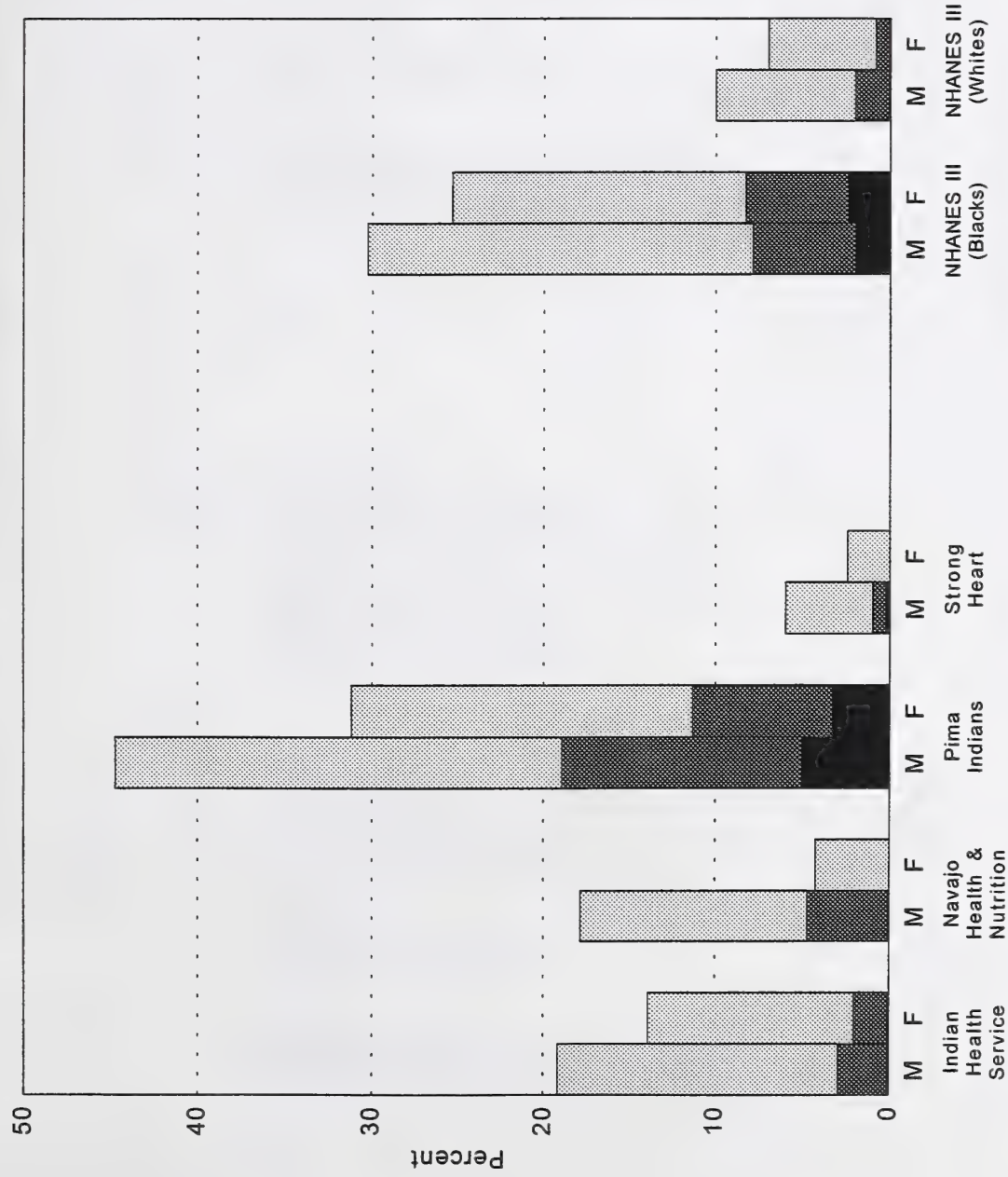
Diabetes: Fasting venous plasma glucose 140 mg/dl (greater or equal to 7.8 mM) or 2-hr. venous plasma glucose 200 mg/dl (greater or equal to 11.1 mM).

Source: WHO Study Group, Technical Report Series, Geneva, 1985.

Figure 2-9. Prevalence of Hypertension by Stages

American Indian and Alaska Native Males and Females Aged 45-64 Years

Age Adjusted to 1990 U.S. Resident Population



Classification of Blood Pressure for Adults with Hypertension

Stage 1: SBP 140-159 mm/Hg and/or DBP 90-99 mm/Hg
 Stage 2: SBP 160-179 mm/Hg and/or DBP 100-109 mm/Hg
 Stage 3: SBP 180-209 mm/Hg and/or DBP 110-119 mm/Hg
 Stage 4: SBP greater than or equal to 210 mm/Hg and/or DBP greater than or equal to 120 mm/Hg

Source: JNC V, January 1993.

Figure 2-10. Awareness, Treatment, and Control of Hypertension

American Indians Aged 45-64 Years

Age Adjusted to 1990 U.S. Resident Population

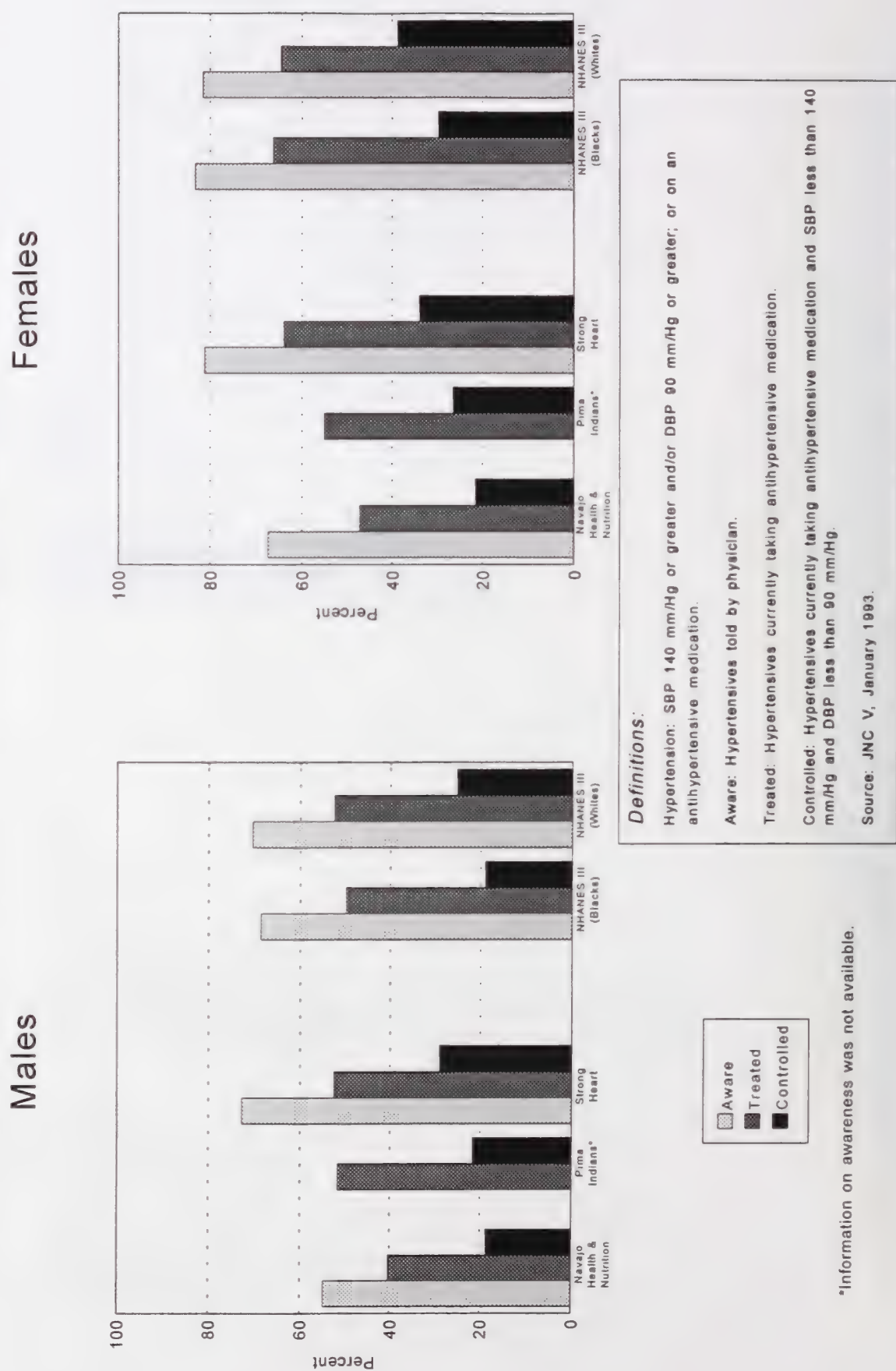
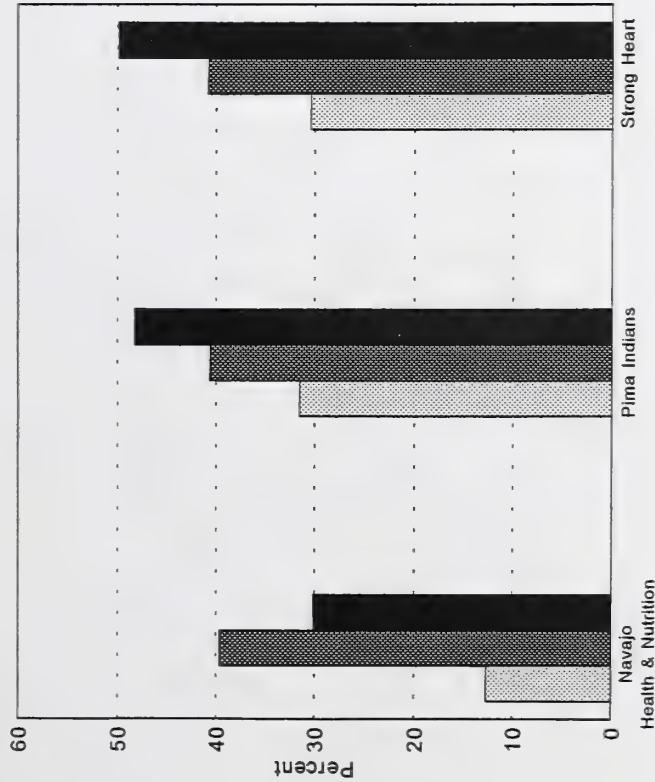


Figure 2-11. Prevalence of Hypertension by Glucose Tolerance

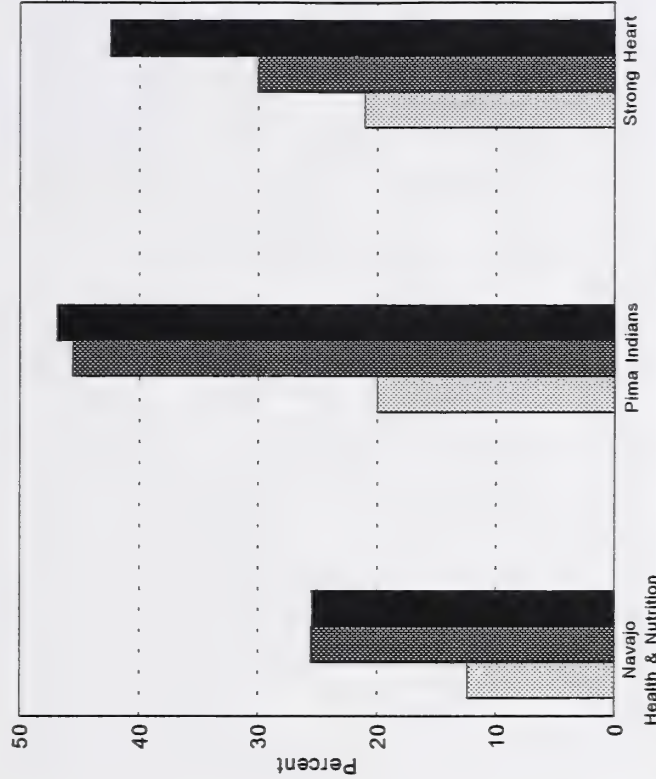
American Indians Aged 45-64 Years

Age Adjusted to 1990 U.S. Resident Population

Males



Females



Definitions:

Hypertension: SBP 140 mm/Hg or greater and/or DBP 90 mm/Hg or greater; or on an antihypertensive medication.

Impaired Glucose Tolerance: Fasting venous plasma glucose 140 mg/dl (less than 7.8 mM) and 2-hr. venous plasma glucose 200 mg/dl (7.8 mM-11.0 mM).

Diabetic: Fasting venous plasma glucose 140 mg/dl (greater than or equal to 7.8 mM) or 2-hr. venous plasma glucose 200 mg/dl (greater than or equal to 11.1 mM).

Source: JNC V, January 1993; Who Study Group, Technical Report Series, Geneva, 1985.

Section III. Hypertension in Asian and Pacific Islander Americans

Overview

As of 1994, Asian and Pacific Islander Americans (APIA) represented 3.6 percent of the total U.S. population and were the fastest growing segment of the population.^{14,15} This growth of APIAs from 1.5 million in 1970 to 9.2 million in 1994 resulted largely from the easing of restrictions on immigration. Included in this very diverse group are Asian Indian, Burmese, Cambodian, Ceylonese, Chormorro, Chinese, Dutch East Indian, Fijian, Filipino, Guamanian, Gilbertese, Hawaiian, Japanese, Javanese, Korean, Laotian, Malaysian, Maori, Marshallese, Pakistani, Ponapean, Samoan, Siamese, Thai, and Vietnamese subgroups.

Two-thirds of APIAs live in five States and 80 percent live in 10 States. Of the four major regions in the United States, the largest number of APIAs live in the West (over 4 million), followed by the Northeast, the South, and the Midwest. The six largest subgroups of APIAs are the Chinese, Filipino, Japanese, Asian Indian, Korean, and Vietnamese. Again, their locations demonstrate some regional variations with Filipinos comprising the largest group in the West, Chinese in the Northeast and South, and Asian Indians in the Midwest.¹⁶

Overall, APIAs are younger, more highly educated, earn more, and have larger family sizes than the general population. Almost all APIAs live in suburbs (49 percent) or central cities (45 percent).¹⁷ Averages, however, mask wide differences among subgroups. More recent Southeast Asian immigrants have larger families and lower socioeconomic status than the total population, while Japanese, Asian Indian, and Filipino exhibit relatively high income, educational attainment, and low

rates of poverty.¹⁶ More recent immigrants often support not only their immediate families, but also other family members in their native countries.¹⁸

There are such immense differences in lifestyle, diet, and health behaviors, that it is difficult to make any comparisons among these subgroups of APIAs. Changes in demographic patterns, such as the recently increased influx of Southeast Asians, have accentuated the differences among the subgroups. These recent immigrants have brought with them health attitudes and behaviors far different from those of the older, more established Asian Americans, as well as different abilities to access health care. In addition, there are generational differences within each population; for example, the dietary patterns of members of the second generation born in the United States often reflect substantial changes from those of previous generations.

According to the 1990 National Center for Health Statistics report *Health, United States*, 36 percent of total deaths in APIAs were due to diseases of the heart and cerebrovascular disease. As we increase our knowledge about how socioeconomic status and demographic characteristics affect the cardiovascular risk profiles of APIAs, we can begin to implement culturally acceptable intervention efforts.

Study Descriptions

The following are descriptions of the studies included in this section. Each description provides a brief overview of an individual study's timeframe, sample, design, and primary objectives. Although this section focuses on data from the Asian and Pacific Islander American population, the descriptions provided may refer to a study's larger, overall population and study design. A more detailed explanation of the study design and findings may be found within the references following each study description.

A shortened study name is enclosed within parentheses following the name of each study. These are used in place of the longer study names on all figures and tables.

The Chicago School Children's Study (Chicago Children)

From 1975 to 1978, the Chicago Department of Health conducted a health screening program that included blood pressure and various anthropometric measurements for children in non-public schools. The children classified themselves as White, Black, Asian, and Latino (Mexican, Puerto Rican, and other Latinos). The study provided an opportunity to examine possible racial differences in blood pressure and anthropometric measurements. A total of 1,318 boys and 1,548 girls aged 6 to 9 years were screened.

Reference:

Levinson S, Liu K, Stamler J, et al. Ethnic differences in blood pressure and heart rate of Chicago school children. *Am J Epidemiol*. 1985 Sep;122(3):366-77.

The Hawaii/Los Angeles/Hiroshima Study (Hawaii) (Los Angeles) (Hiroshima)

The Hawaii/Los Angeles/Hiroshima study examined hypertension data of 436, 733, and 884 native Japanese men, aged 40 to 79 years, living in Hawaii, Los Angeles, and Hiroshima, respectively, who underwent medical examination in 1986 and 1988. The study examined the association between hypertension and levels of serum glucose, insulin, triglyceride, and total cholesterol.

References:

Kawate R, Yamakido M, Nishimoto Y, et al. Diabetes mellitus and its vascular complications in Japanese migrants on the island of Hawaii. *Diabetes Care*. 1979 Mar-Apr;2(2):161-70.

Hara H, Egusa G, Yamakido M, et al. The high prevalence of diabetes mellitus and hyperinsulinemia among the Japanese-Americans living in Hawaii and Los Angeles. *Diabetes Res Clin Pract*. 1994 Oct;24(Suppl):S37-42.

The Honolulu Heart Program (Honolulu Heart)

The Honolulu Heart Program is a prospective epidemiological investigation of coronary heart disease (CHD), hypertension, and stroke among men of Japanese ancestry living in Hawaii. In the initial examination between 1965 and 1968, 8,006 men aged 45 to 68 years participated. The four primary objectives of the study were (1) to estimate morbidity and mortality resulting from CHD, hypertension, and stroke among men of Japanese ancestry living in Hawaii; (2) to compare the

frequency of CHD, hypertension, and stroke in that population with that of comparable populations in Japan and on the U.S. mainland; (3) to assess the possible effects of environmental and lifestyle changes on the risk for CHD and stroke among Japanese migrants to Hawaii; and (4) to investigate biological, lifestyle, and psychosocial factors associated with CHD, hypertension, and stroke among Japanese men in Hawaii. Data reported here are from an examination of a 30 percent random sample of the population in 1980 to 1982 when the men were between 60 and 81 years of age.

References:

Kagan A, Harris BR, Winklestein W Jr, et al. Epidemiological studies of coronary heart disease and stroke in Japanese men living in Japan, Hawaii, and California: demographic, physical, dietary, and biochemical characteristics. *J Chron Dis*. 1974;27:345-64.

The Kaiser Permanente Study (Kaiser Permanente)

The Kaiser Permanente study examined cardiovascular risk factors among 13,031 Asian Americans (Chinese, Filipino, Japanese, and other Asian) living in northern California. Researchers looked at risk factors for U.S.-born Asians versus those born in their country of origin. The surveyed group voluntarily took routine health examinations offered by the prepaid health care program during 1978 through 1985.

Reference:

Angel A, Armstrong MA, Klatsky AL. Blood pressure among Asian-Americans living in northern California. *Am J Cardiol*. 1989 Jul 15;64(3):237-40.

The Molokai Heart Study (Molokai)

The Molokai Heart Study was a study of cardiovascular disease risk factors in 250 male and female Native Hawaiians between the ages of 20 and 59 years living on the rural island of Molokai. The survey was carried out in 1985 in conjunction with the INTERSALT project, an international cooperative study on sodium and potassium intake and blood pressure. The blood pressure measurement, training, and data collection instruments were those of INTERSALT.

References:

Curb JD, Aluli NA, Kautz JA, et al. Cardiovascular risk in ethnic Hawaiians. *Am J Public Health*. 1991 Feb;81(2):164-7.

Elliott P, Stamler R. Manual of operations for INTERSALT, an international cooperative study on the relation of sodium and potassium to blood pressure. *Cont Clin Trials*. 1988 Jun;9(2 Suppl):1s-117s.

The Multiple Risk Factor Intervention Trial (MRFIT)

The Multiple Risk Factor Intervention Trial (MRFIT) screening team examined 361,662 men aged 35 to 57 years living in the contiguous United States. The screening took place in 22 clinical centers between 1973 and 1975. Participants identified themselves as "White," "Black," "Oriental," "Spanish-American," "American Indian," or "Other." Since the study was designed only to identify men eligible for the trial, no effort was made to obtain a representative sample of any defined population. The study provided, however, an opportunity to compare relatively large numbers of these ethnic groups with Whites.

While the study did not seek to obtain a representative sample of any defined population, it is considered a significant study of blood pressure levels in U.S. minority populations. For this section, MRFIT data on Asian and Pacific Islander Americans were extracted from the original aggregated data and are presented here with data from other studies of the prevalence of hypertension in Asian and Pacific Islander Americans.

References:

The multiple risk factor intervention trial (MRFIT). A national study of primary prevention of coronary heart disease. JAMA. 1976 Feb 23;235(8):825-7.

Statistical design considerations in the NHLI multiple risk factor intervention trial (MRFIT). The Multiple Risk Factor Intervention Trial Group. J Chron Dis. 1977 May;30(5):261-75.

The Seattle Japanese American Diabetes Study (Seattle Japanese)

The Seattle Japanese American Diabetes Study surveyed 229 men and 191 women who were second- and third-generation Japanese Americans born and raised in the mainland United States. Subjects were aged 34 to 75 years and resided in King County, Washington. Data were collected between 1983 and 1988. To provide sociodemographic information and an estimate of prevalence of known diabetes in the study population, a reference sample was derived. Men and women in the study were assessed for diabetes status and glucose tolerance, as well as the prevalence of cardiovascular disease (hypertension, coronary heart disease, and peripheral vascular disease).

References:

Fujimoto WY, Leonetti DL, Kinyoun JL, et al. Prevalence of diabetes mellitus and impaired glucose tolerance among second-generation Japanese-American men. Diabetes. 1987 Jun;36(6):721-9.

Fujimoto WY, Leonetti DL, Bergstrom RW, et al. Glucose intolerance and diabetic complication among Japanese-American women. Epidemiological Note. Diabetes Res Clin Pract. 1991 Aug;13(1-2):119-29.

Table 3-1 Study Design Summary Asian and Pacific Islander Studies ¹					
Study	Ethnic Group/Subgroup	Ages (years)	Sample Size	Location	Study Dates
Chicago Children	Asian American	6-9	2,866	Chicago, IL	1975-78
Hawaii/Los Angeles/Hiroshima	Japanese American Japanese	40-79	2,053	Hawaii; Los Angeles, CA; Hiroshima, Japan	1986-88
Honolulu Heart	Japanese American	60-81	8,006	Honolulu, HI	1980-82
Kaiser Permanente	Asian American	18-75+	13,031	Northern California	1978-85
Molokai	Native Hawaiian	20-59	250	Molokai, HI	1985
MRFIT	Oriental ²	35-57	4,100	California	1973-75
Seattle Japanese	Japanese American	34-75	420	King County, WA	1983-88

¹This table includes study data that included native Japanese; therefore, the table's title does not include the word "American" so as not to limit its scope.

²Although the term "Oriental" does not reflect current usage, the term is retained here since it was used in the study.

Table 3-2 Blood Pressure Measurement Protocols Asian and Pacific Islander American				
Study	Random Zero Sphygmomanometer Used	Number of Readings	Readings Used	Participant Position
Chicago Children	No	4	2nd and 3rd	Supine
Hawaii/Los Angeles/Hiroshima	No	N.A.*	N.A.*	Supine
Honolulu Heart	Yes	3	2nd and 3rd	Seated
Kaiser Permanente	No	1	Does not apply	N.A.*
Molokai	Yes	3	2nd and 3rd	Seated
MRFIT	No	3	2nd and 3rd	Seated
Seattle Japanese	No	3	2nd and 3rd	Supine

* Information not available.

Figure 3-1. Mean Systolic Blood Pressure

Asian and Pacific Islander Americans Aged 18 Years and Over, Part I

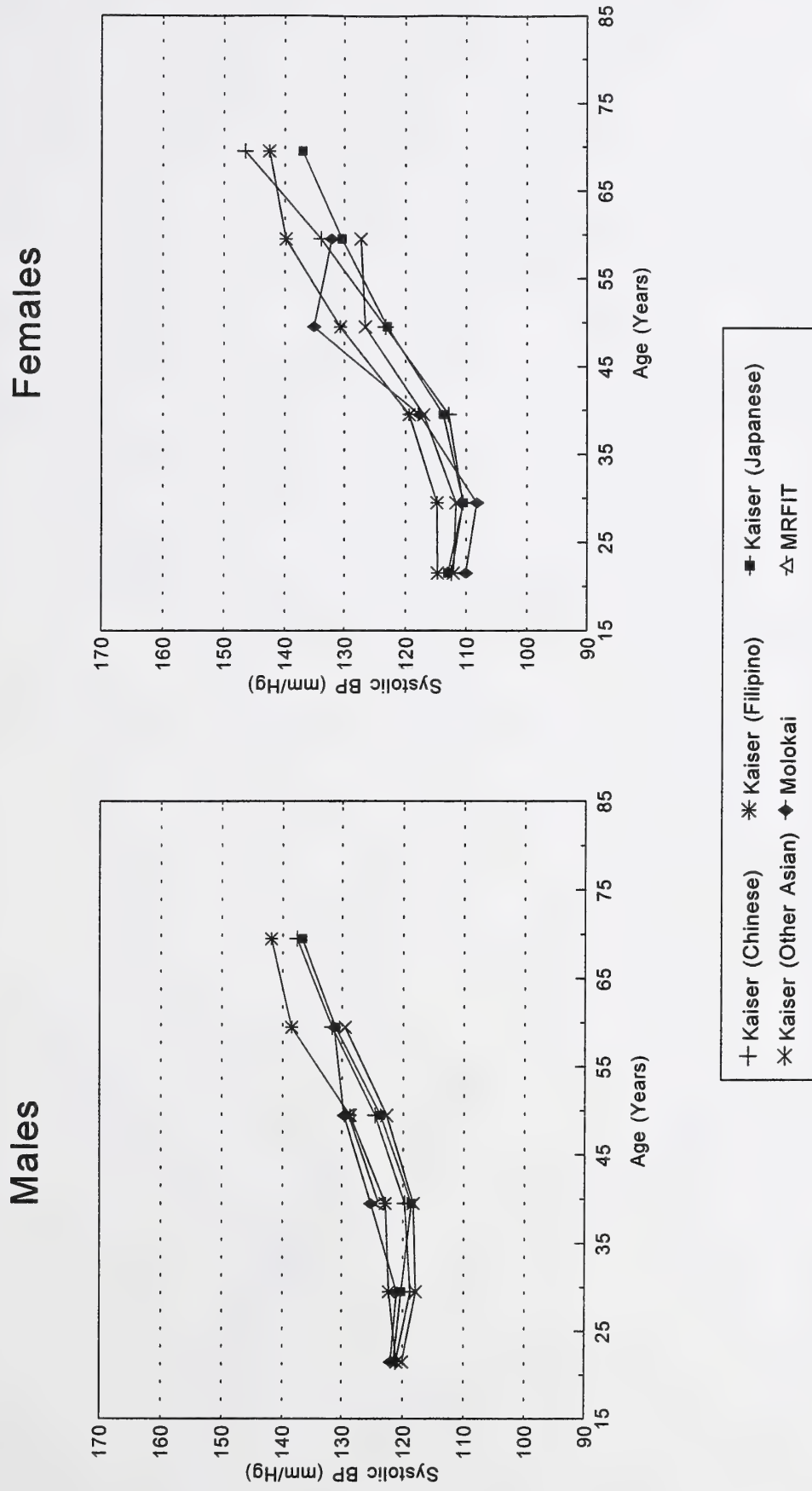


Figure 3-2. Mean Diastolic Blood Pressure
Asian and Pacific Islander Americans Aged 18 Years and Over, Part I

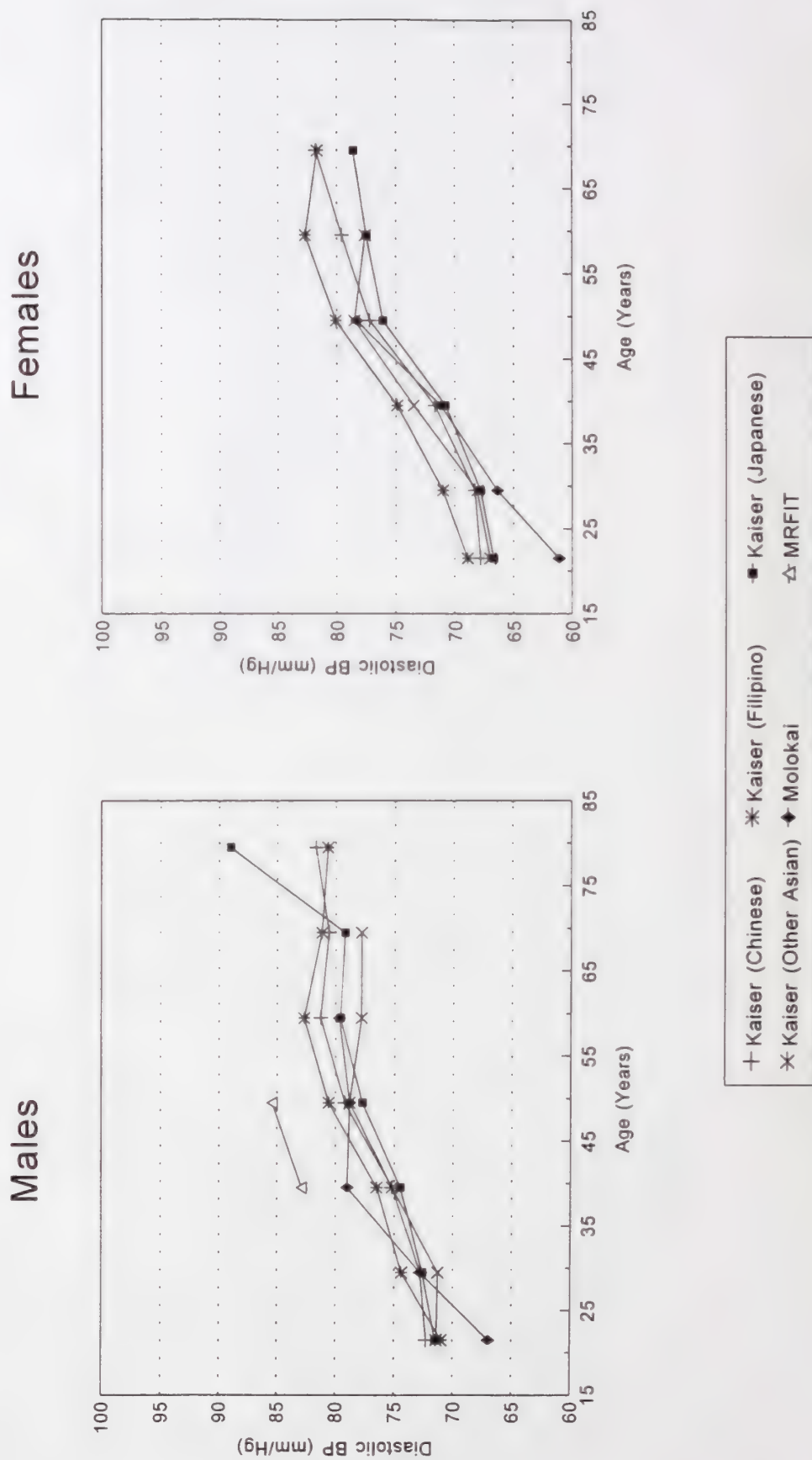


Figure 3-3. Mean Systolic Blood Pressure
Asian and Pacific Islander Americans Aged 18 Years and Over, Part II

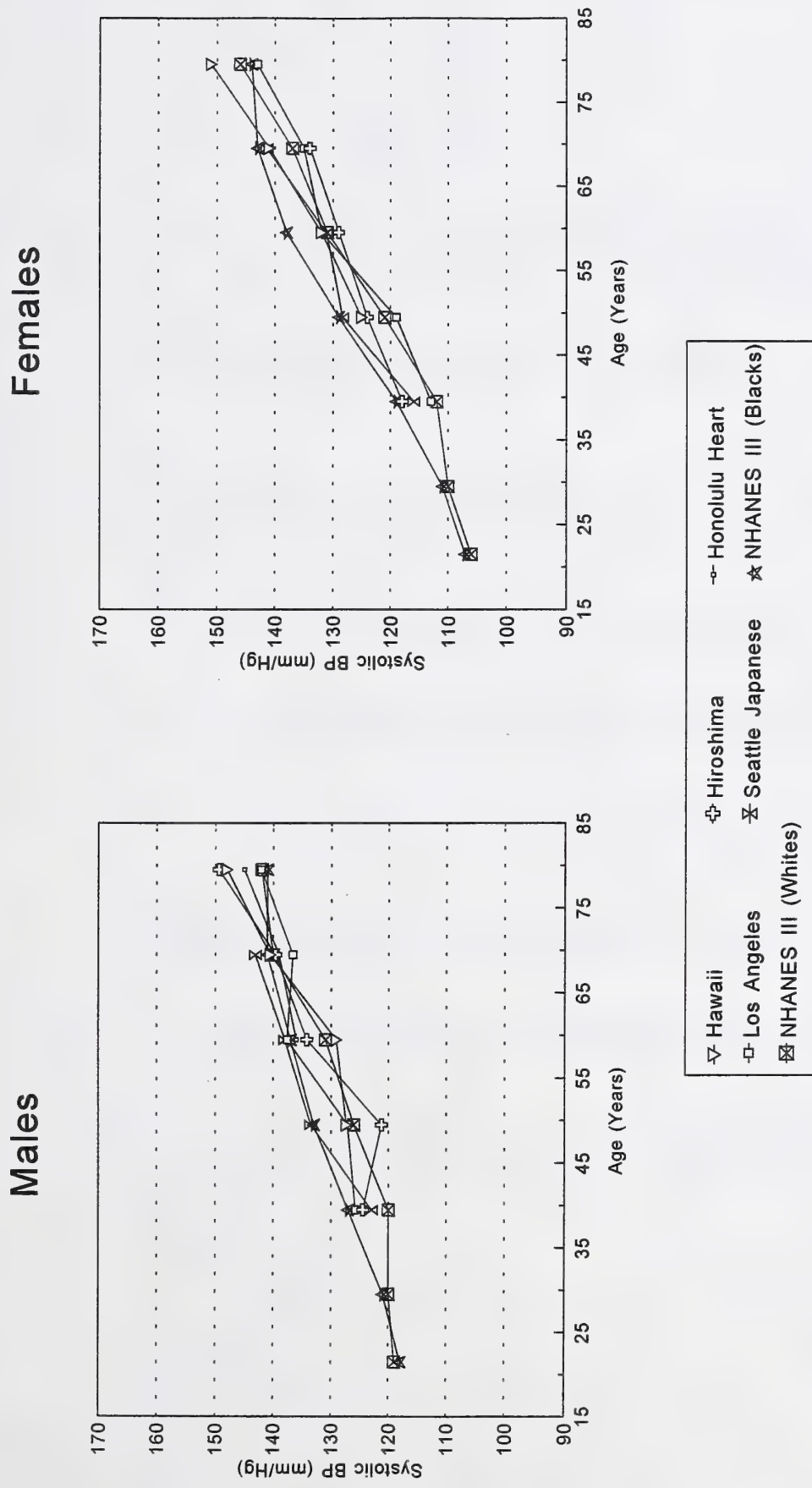


Figure 3-4. Mean Diastolic Blood Pressure

Asian and Pacific Islander Americans Aged 18 Years and Over, Part II

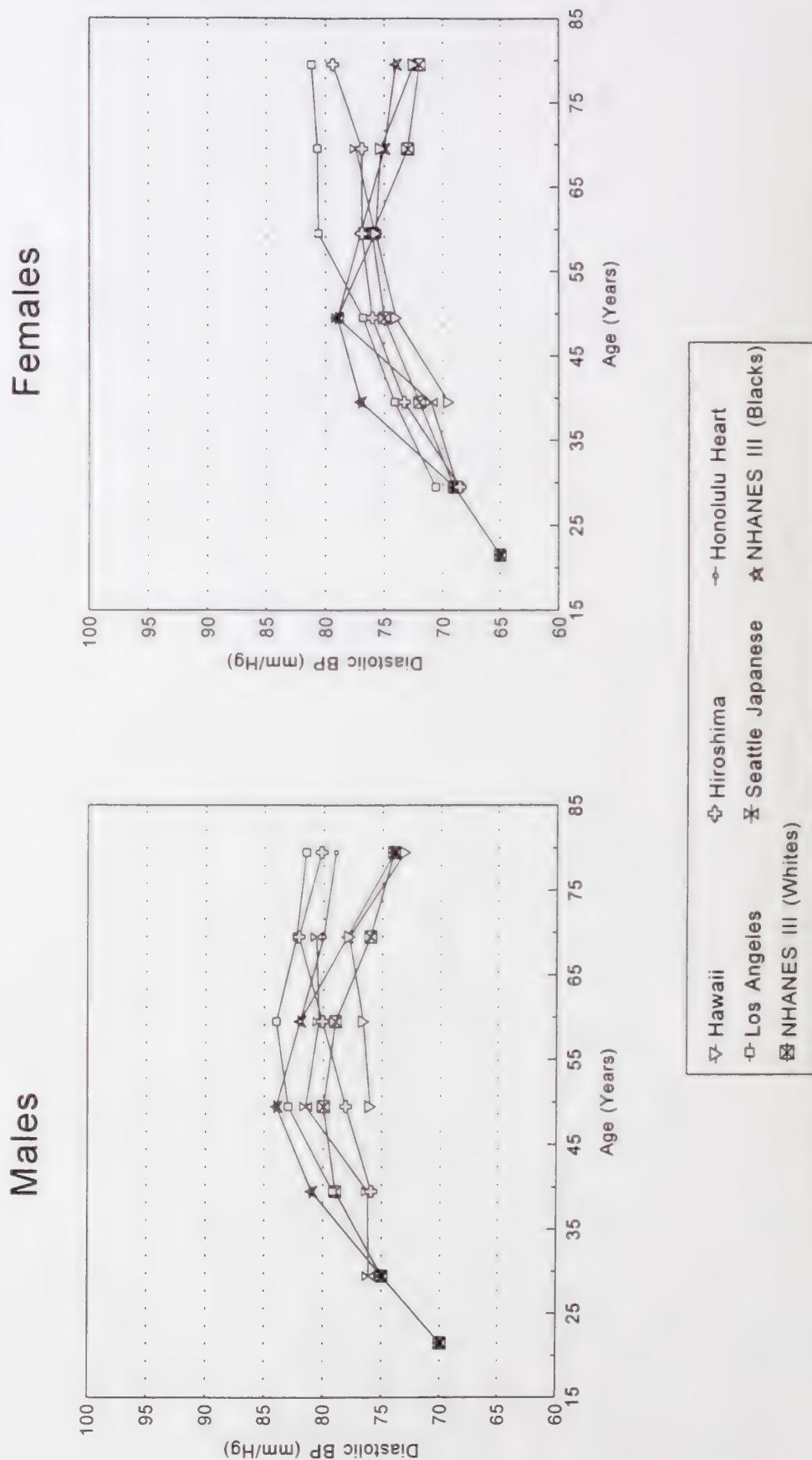


Figure 3-5. Mean Systolic Blood Pressure
Asian and Pacific Islander American Males and Females Aged 45-64 Years
 Age Adjusted to 1990 U.S. Resident Population

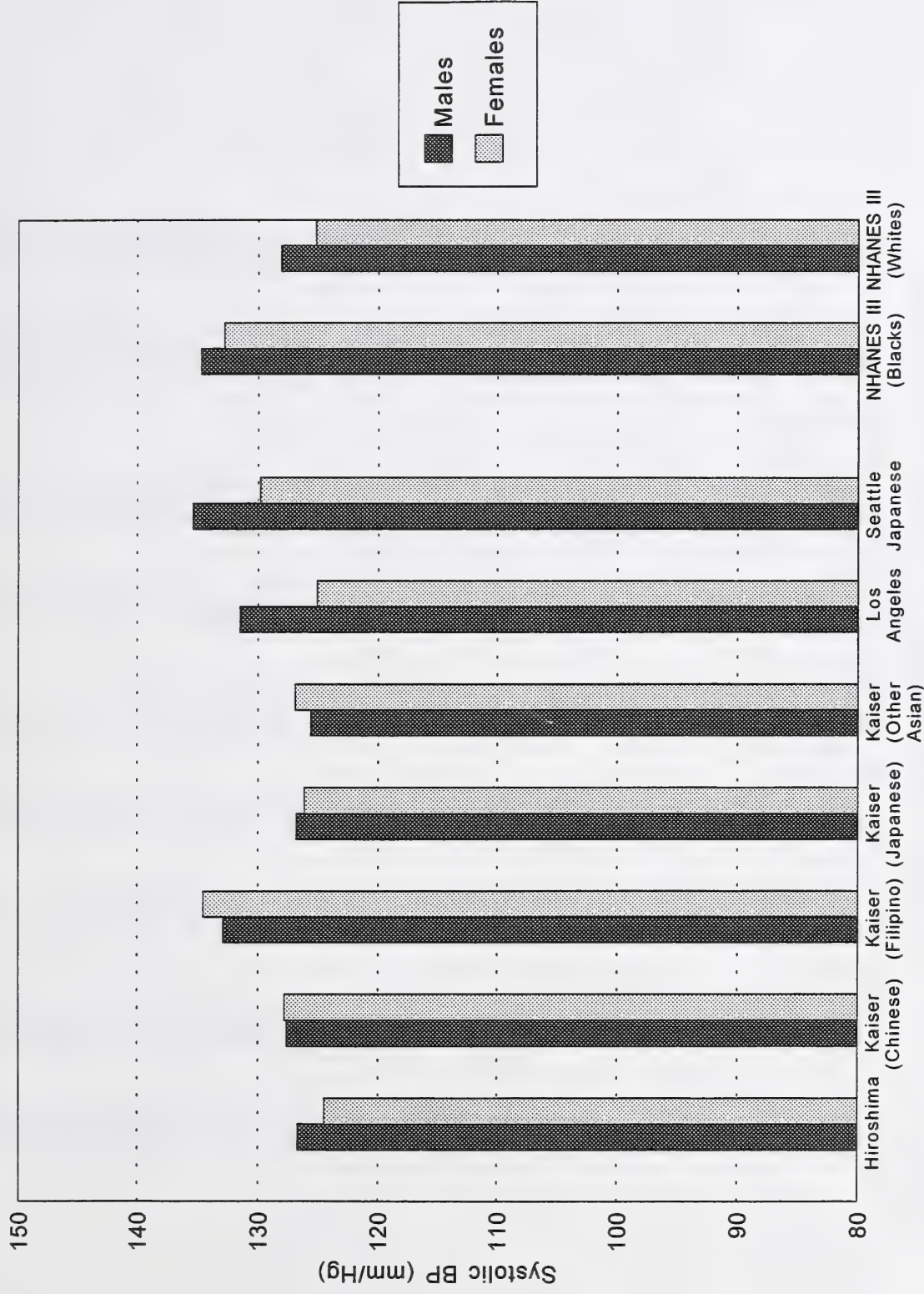


Figure 3-6. Mean Diastolic Blood Pressure
Asian and Pacific Islander American Males and Females Aged 45-64 Years
 Age Adjusted to 1990 U.S. Resident Population

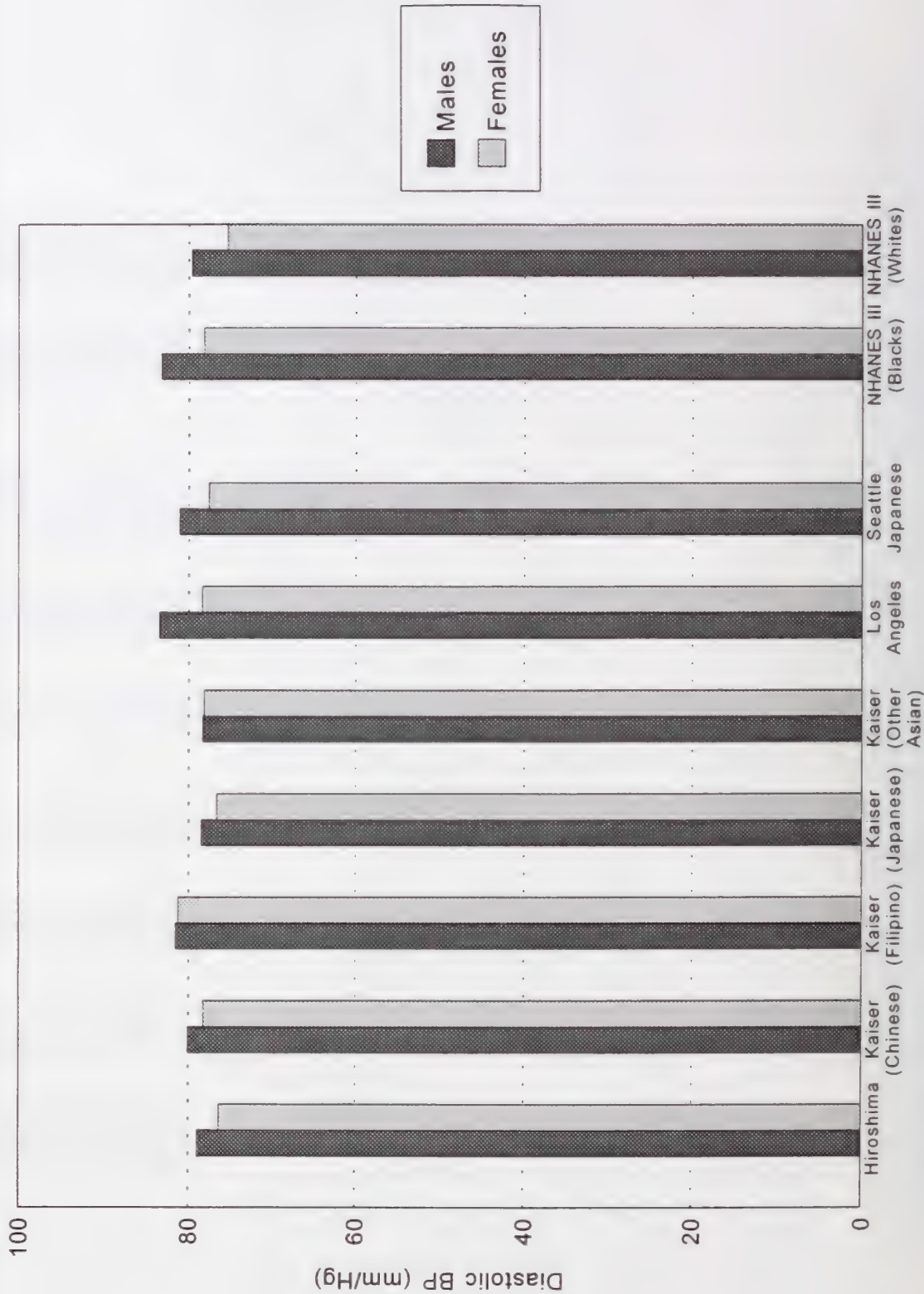


Figure 3-7. Mean Body Mass Index
Asian and Pacific Islander Americans Aged 18 Years and Over, Part I

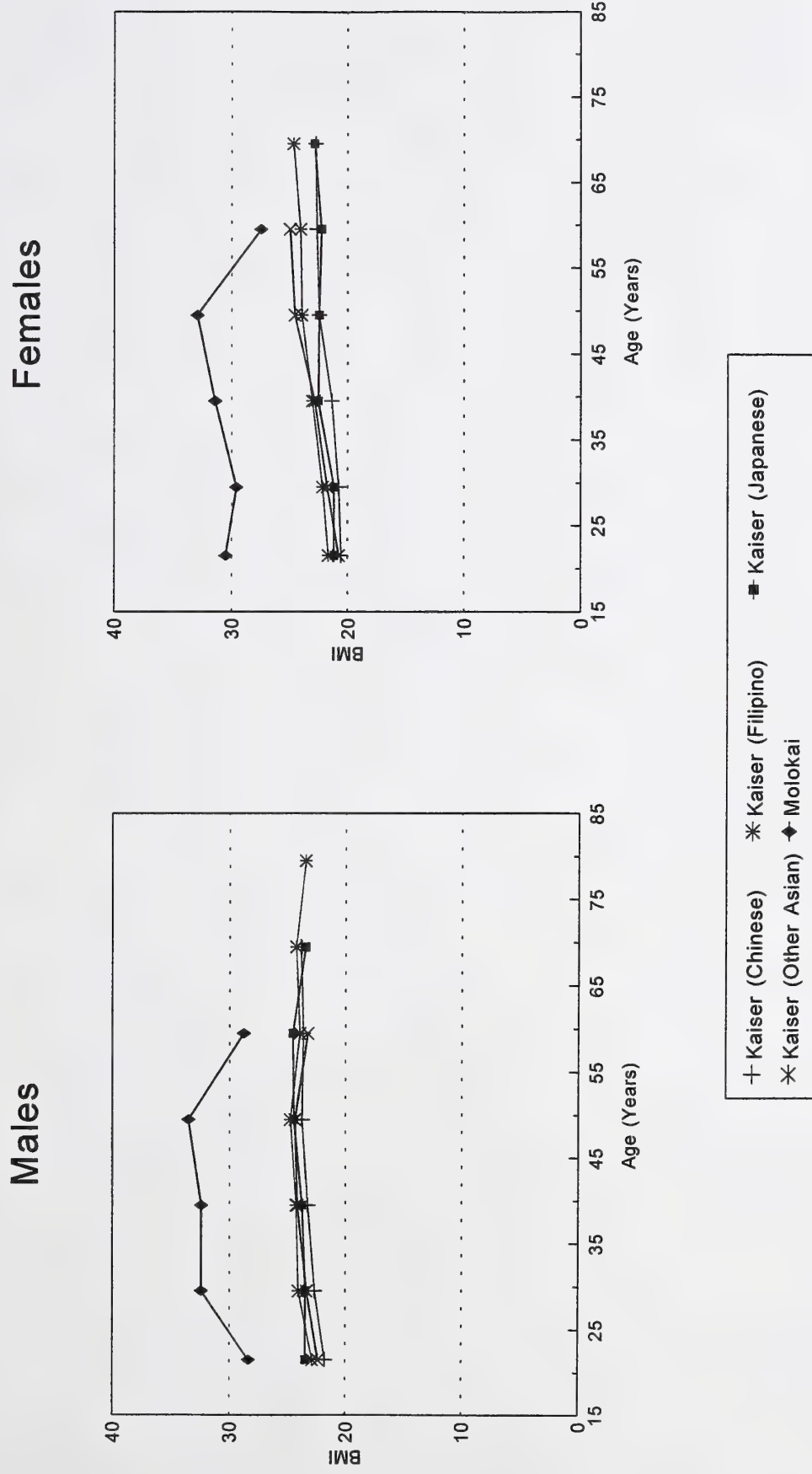


Figure 3-8. Mean Body Mass Index
Asian and Pacific Islander Americans Aged 18 Years and Over, Part II

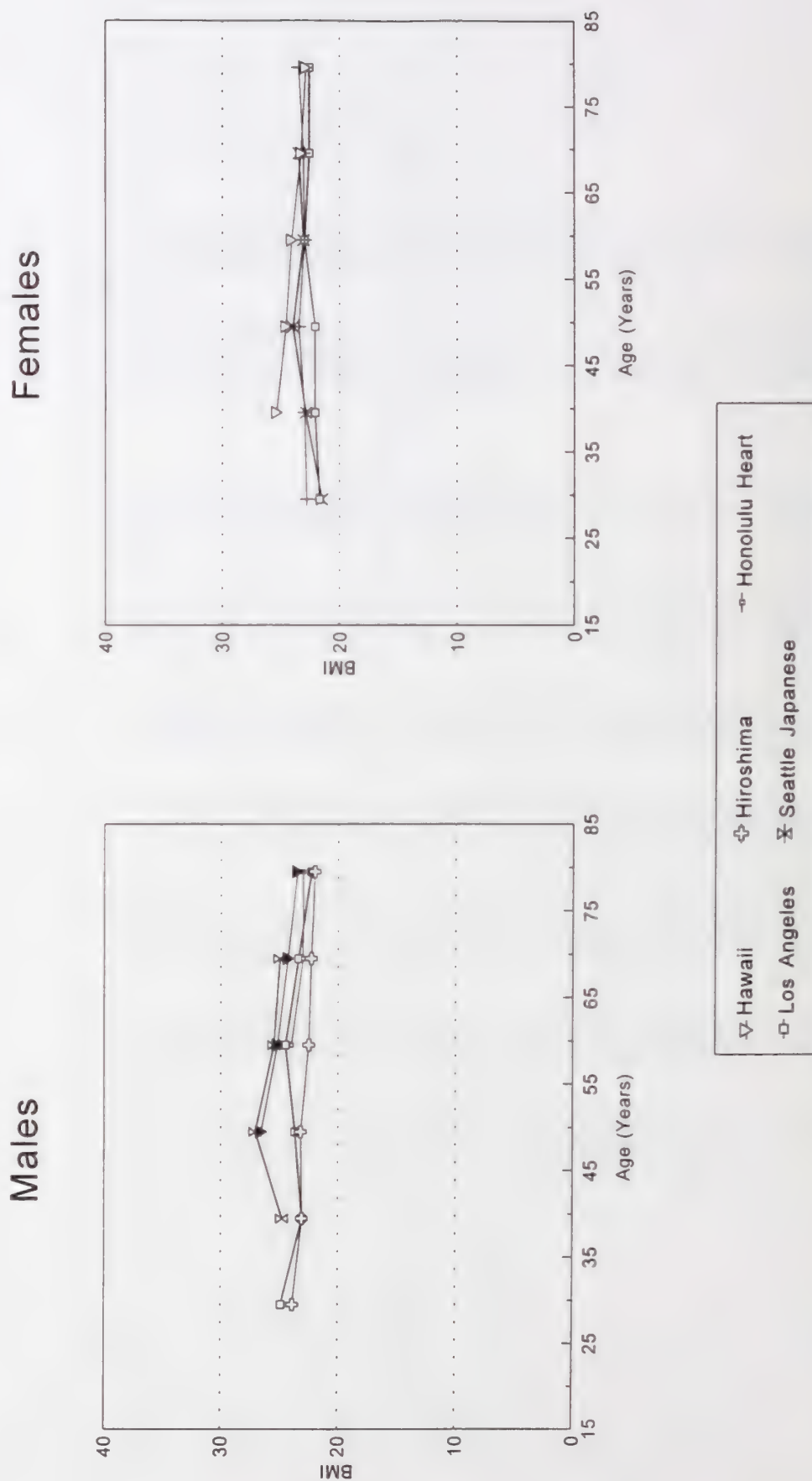
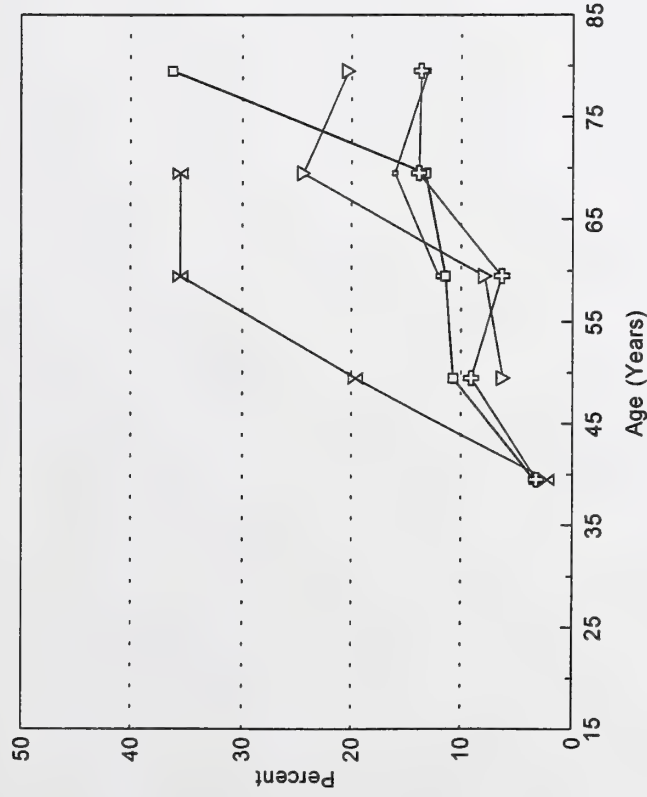


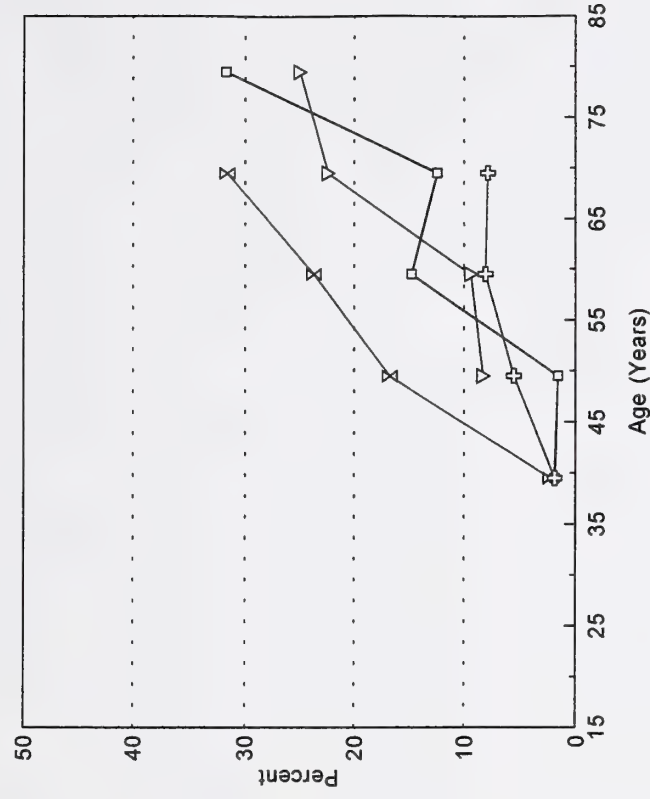
Figure 3-9. Prevalence of Diabetes

Asian and Pacific Islander Americans Aged 18 and Over

Males



Females



Definition:

Diabetes: Fasting venous plasma glucose 140 mg/dl (greater or equal to 7.8 mM) or 2-hr. venous plasma glucose 200 mg/dl (greater or equal to 11.1 mM).

Source: WHO Study Group, Technical Report Series, Geneva, 1985.

▽ Hawaii ⊕ Hiroshima - - - Honolulu Heart
 □ Los Angeles ⊗ Seattle Japanese

Figure 3-10. Mean Systolic Blood Pressure
Asian and Pacific Islander American Children Aged 3-18 Years

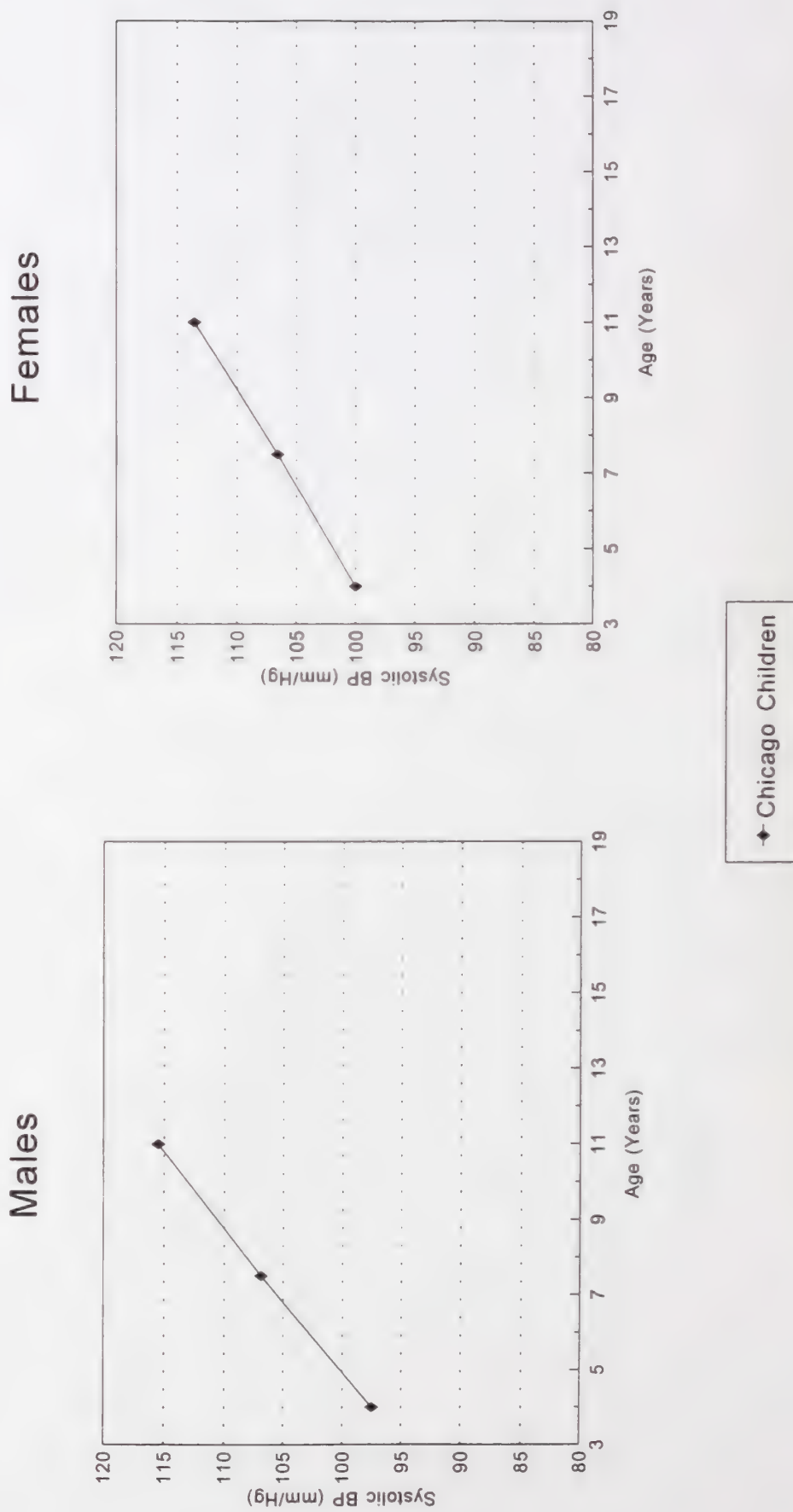
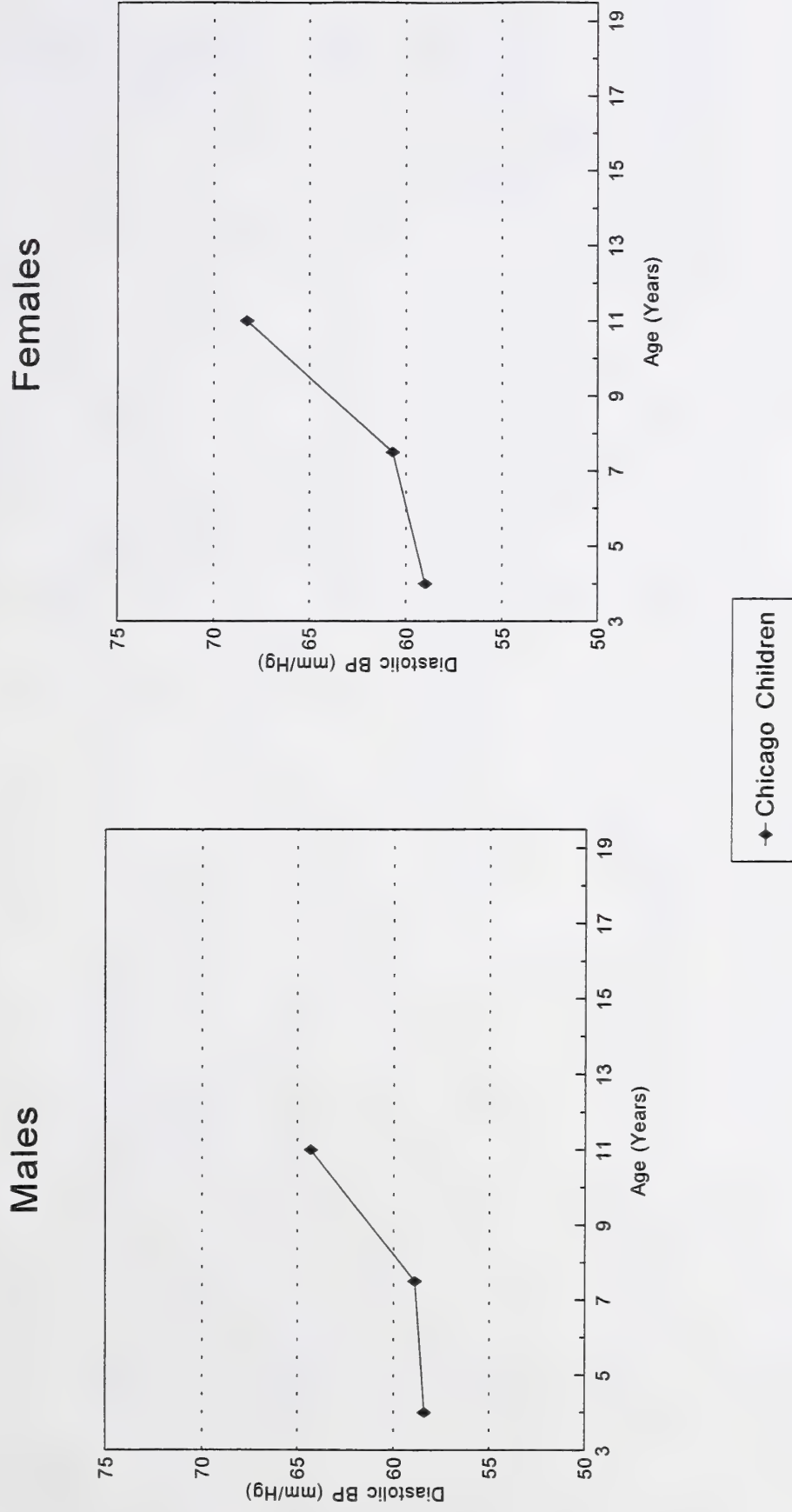


Figure 3-11. Mean Diastolic Blood Pressure
Asian and Pacific Islander American Children Aged 3-18 Years



References

1. U.S. Bureau of the Census. Hispanic Americans Today. Current Population Reports. 1993;p23, no.183.
2. Haynes SG, Harvey C, Montes H, et al. Patterns of cigarette smoking among Hispanics in the United States: results from HHANES 1982-84. *Am J Public Health*. 1990 Dec;80(Suppl):47-54.
3. Task Force on Black and Minority Health. Report of the Secretary's Task Force on Black and Minority Health. Hispanic Health Issues. Vol. VIII. Washington, DC: Department of Health and Human Services; 1986.
4. National Institute on Alcohol Abuse and Alcoholism. National survey of alcohol use, 1979.
5. Texas Behavioral Risk Factor Survey. Texas Department of Health. Austin, Texas, 1991.
6. Caetano R. Hispanic drinking practices in northern California. *Hispanic J of Behavioral Sciences*. 1984;6:345-64.
7. Hazuda HP, Heffner SM, Stern MP, et al. Effects of acculturation and socioeconomic status on obesity and diabetes in Mexican Americans: the San Antonio Heart Study. *Am J Epidemiol*. 1988;128:1289-1301.
8. Franco LJ, Stern MP, Rosenthal M, et al. Prevalence, detection, and control of hypertension in a biethnic community: the San Antonio Heart Study. *Am J Epidemiol*. 1985;121(5):684-96.
9. Friis R, Nanjuddappa G, Prendergast TJ Jr, et al. Coronary heart disease mortality and risk among Hispanics and non-Hispanics in Orange County, California. *Public Health Rep*. 1981 Sep-Oct;96(5):418-22.
10. Fleming CM. American Indians and Alaska Natives: changing societies past and present. In: Orlandi MA, ed. Cultural competence for evaluators: a guide for alcohol and other drug abuse prevention practitioners working with ethnic/racial communities. Rockville, MD: Substance Abuse and Mental Health Services Administration; 1992, p. 152. DHHS publication no. (ADM)92-1884.
11. U.S. Bureau of the Census. We the first Americans. Washington, DC. September 1993, pp. 8-11.
12. Rhoades ER. American Indian and Alaska Natives: overview of the population. Bethesda, MD: U.S. Department of Health and Human Services, National Heart, Lung, and Blood Institute, Epidemiology and Clinical Applications Division. Forthcoming.
13. Heard J, Denney RP. Constituency concerns. In: Coordinating Federal health care: progress and promise. Issue papers. Bethesda, MD: Uniformed Services University of the Health Sciences, May 1993, p. V-14.
14. U.S. Bureau of the Census. Statistical Abstract of the United States: 1994[CD-ROM] (CD-SA-94) Washington, DC, 1994, table no. 17.

15. Yu ESH, Liu WT. US national health data on Asian Americans and Pacific Islanders: a research agenda for the 1990s. *Am J Public Health*. 1992;82(12):1645-52.
16. Bureau of the Census (US). Statistical abstract of the United States: 1993 (113th edition.) Washington, DC: 1993.
17. U.S. Bureau of the Census. Asian and Pacific Islander Americans: a profile. Statistical Brief. July 1993; SB/93-12:1-2.
18. Kim S, McLeod JH, Shantzis C. Cultural competence for evaluators working with Asian-American communities: some practical considerations. In: Orlandi MA, ed. Cultural competence for evaluators: a guide for alcohol and other drug prevention practitioners working with ethnic/racial communities. Rockville, MD: Substance Abuse and Mental Health Services Administration; 1992, pp. 173-201. DHHS publication no. (ADM)92-1884.

Appendix

The following tables contain raw data for studies presented in this Databook. The tables are arranged in alphabetical order by ethnic group as follows:

HISPANIC AMERICANS

Brooks County: Hispanic American Children	67
Chicago Children: Latino American Children	68
HHANES: Cuban Americans	69
HHANES: Mexican Americans	70
HHANES: Puerto Rican Americans	71
Mexico City: Mexicans	72
MRFIT: Hispanic Americans, Combined for all Clinics.	73
NHANES III: Mexican Americans	74
San Antonio Heart 1&2: Mexican Americans	75
Stanford Five City: Hispanic Americans	76
Starr County: Mexican Americans	77

AMERICAN INDIANS AND ALASKA NATIVES

Indian Health Service: American Indians and Alaska Natives	81
MRFIT: American Indians Combined for all Clinics	82
Navajo Adolescent: American Indian Children	83
Navajo Health & Nutrition: American Indians	84
Pima Indians: American Indians	85
St. Lawrence Island: Yupik Eskimos	86
Strong Heart: American Indians	87

ASIAN AND PACIFIC ISLANDER AMERICANS

Chicago Children: Asian and Pacific Islander American Children	91
Hawaii, Los Angeles, and Hiroshima: Japanese Living in Hawaii	92

Hawaii, Los Angeles, and Hiroshima: Japanese Living in Japan	93	THIRD NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY, PHASE I
Hawaii, Los Angeles, and Hiroshima: Japanese Living in Los Angeles	94	NHANES III: Non-Hispanic Black Americans 109
Honolulu Heart: Japanese Americans	95	NHANES III: Non-Hispanic White Americans 110
Kaiser Permanente: Chinese Americans	96	
Kaiser Permanente: Filipino Americans	97	
Kaiser Permanente: Japanese Americans	98	
Kaiser Permanente: Other Asian Americans	99	
Molokai: Native Hawaiians	100	
MRFIT: Asian Americans, Combined for all Clinics	101	
Seattle Japanese: Japanese Americans	102	

THE MULTIPLE RISK FACTOR INTERVENTION TRIAL SCREENING DATA

MRFIT: Black Americans, Combined for all Clinics	105
MRFIT: White Americans, Combined for all Clinics	106

HISPANIC AMERICANS

Brooks County Hispanic American Children

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive*	Hypertensive		
					Percent Aware*	Percent Treated*	Percent Controlled*
Males							
3-5	20	85.5	49.7				
6-9	77	95.0	56.7				
10-12	43	101.3	62.3				
13-15	46	109.9	66.9				
16-17	22	113.3	69.8				
Females							
3-5	22	83.3	49.2				
6-9	61	92.7	56.4				
10-12	43	99.2	62.7				
13-15	43	104.3	68.4				
16-17	24	108.6	68.2				

*Category not applicable for this study.

Chicago Children Latino American Children

	Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive*	Hypertensive		
						Percent Aware*	Percent Treated*	Percent Controlled*
Males	3-5	17	100.5	53.9				
	6-9	106	105.0	56.1				
	10-12	9	115.6	56.7				
	13-15	0	-	-				
	16-17	0	-	-				
Females	3-5	17	99.8	52.2				
	6-9	134	104.8	56.9				
	10-12	4	109.0	58.0				
	13-15	0	-	-				
	16-17	0	-	-				

*Category not applicable for this study.

HHANES

Cuban Americans

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive	Hypertensive		
					Percent Aware	Percent Treated	Percent Controlled
Males							
18-24	55	113	70	2	100	0	0
25-34	63	119	77	6	25	0	0
35-44	52	119	78	13	57	43	29
45-54	114	128	84	37	74	43	19
55-64	76	135	82	43	73	48	9
65-74	41	137	79	46	53	37	16
75+	0	-	-	-	-	-	-
Females							
18-24	52	104	65	0	0	0	0
25-34	71	106	70	1	100	100	100
35-44	94	116	73	5	100	40	20
45-54	116	120	77	16	89	67	22
55-64	97	127	78	36	83	54	29
65-74	64	138	77	50	84	72	16
75+	0	-	-	-	-	-	-

*Data unavailable.

HHANES

Mexican Americans

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive	Hypertensive		
					Percent Aware	Percent Treated	Percent Controlled
Males							
18-24	342	117	71	4	13	0	0
25-34	424	118	77	10	33	5	2
35-44	246	118	79	12	43	17	7
45-54	268	126	82	29	58	27	8
55-64	191	133	83	47	61	36	19
65-74	83	140	78	59	47	33	16
75+	0	-	-	-	-	-	-
Females							
18-24	382	107	68	1	50	50	50
25-34	495	109	71	5	87	52	35
35-44	326	113	74	7	71	54	38
45-54	351	123	78	24	73	51	27
55-64	218	131	77	44	75	55	25
65-74	119	140	-	66	77	63	27
75+	0	-	-	-	-	-	-

HHANES

Puerto Rican Americans

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive	Hypertensive		
					Percent Aware	Percent Treated	Percent Controlled
Males							
18-24	111	114	66	1	100	100	100
25-34	107	116	73	5	20	0	0
35-44	73	120	80	15	82	9	0
45-54	102	125	82	26	65	38	4
55-64	79	136	82	49	62	28	10
65-74	23	133	78	48	64	36	18
75+	0	-	-	-	-	-	-
Females							
18-24	169	104	65	1	0	0	0
25-34	166	105	68	2	100	75	75
35-44	152	111	71	8	92	33	25
45-54	174	122	77	27	89	66	30
55-64	97	132	79	46	87	67	27
65-74	53	137	73	53	82	61	29
75+	0	-	-	-	-	-	-

Mexico City Mexicans

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive	Hypertensive		
					Percent Aware	Percent Treated	Percent Controlled
Males							
18-24	0	-	-	-	-	-	-
25-34	4	122	70	0	-	-	-
35-44	389	115	74	9	49	14	0
45-54	322	121	77	18	61	16	11
55-64	221	128	76	30	59	29	6
65-74	3	137	79	67	50	0	0
75+	0	-	-	-	-	-	-
Females							
18-24	0	-	-	-	-	-	-
25-34	6	107	61	0	-	-	-
35-44	564	109	70	6	64	30	21
45-54	478	120	74	22	75	40	24
55-64	287	126	72	32	75	58	26
65-74	7	134	71	29	50	0	0
75+	0	-	-	-	-	-	-

MRFIT

Hispanic Americans, Combined for all Clinics

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive*	Hypertensive		
					Percent Aware*	Percent Treated*	Percent Controlled*
Males							
18-24	0	-	-				
25-34	0	-	-				
35-44	3328	126	83				
45-54	2824	131	86				
55-64	0	-	-				
65-74	0	-	-				
75+	0	-	-				
Females							
18-24	0	-	-				
25-34	0	-	-				
35-44	0	-	-				
45-54	0	-	-				
55-64	0	-	-				
65-74	0	-	-				
75+	0	-	-				

*Data unavailable.

NHANES III

Mexican Americans

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive*	Hypertensive		
					Percent Aware*	Percent Treated*	Percent Controlled*
Males							
18-24	293	117	67				
25-34	326	119	74				
35-44	212	123	79				
45-54	144	128	80				
55-64	159	136	81				
65-74	130	146	80				
75+	61	146	74				
Females							
18-24	247	107	64				
25-34	312	108	67				
35-44	239	116	74				
45-54	144	126	75				
55-64	135	137	76				
65-74	128	141	70				
75+	57	147	68				

*Data unavailable.

San Antonio Heart 1&2

Mexican Americans

Hypertensive					Hypertensive		
Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive	Percent Aware	Percent Treated	Percent Controlled
Males							
18-24	0	-	-	-	-	-	-
25-34	398	117	73	6	48	26	17
35-44	378	118	75	15	70	44	32
45-54	331	121	76	21	67	51	36
55-64	282	130	75	34	67	46	24
65-74	4	142	74	50	50	0	0
75+	0	-	-	-	-	-	-
Females							
18-24	0	-	-	-	-	-	-
25-34	530	106	67	2	64	64	64
35-44	547	111	71	7	89	70	65
45-54	458	119	73	19	84	62	42
55-64	365	127	73	37	76	57	37
65-74	5	135	78	80	100	100	50
75+	0	-	-	-	-	-	-

Stanford Five City Hispanic Americans

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive*	Hypertensive		
					Percent Aware*	Percent Treated*	Percent Controlled*
Males							
18-24	100	122	70				
25-34	173	120	73				
35-44	111	122	77				
45-54	64	128	82				
55-64	33	136	83				
65-74	27	144	82				
75+	0	-	-				
Females							
18-24	103	109	67				
25-34	214	108	68				
35-44	132	113	75				
45-54	88	122	77				
55-64	60	129	77				
65-74	31	137	78				
75+	0	-	-				

*Data unavailable.

Starr County **Mexican Americans**

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive	Hypertensive		
					Percent Aware*	Percent Treated	Percent Controlled
Males							
18-24	27	114	69	0	-	-	-
25-34	85	119	75	13		27	9
35-44	63	125	80	33		33	10
45-54	42	128	80	38		44	19
55-64	32	148	80	53		53	12
65-74	31	147	79	55		71	6
75+	0	-	-	-		-	-
Females							
18-24	82	110	67	4		0	0
25-34	161	111	70	6		50	20
35-44	153	115	71	8		85	23
45-54	116	134	79	45		60	15
55-64	107	143	80	53		54	9
65-74	48	159	80	88		67	12
75+	0	-	-	-		-	-

*Data unavailable.

AMERICAN INDIANS AND ALASKA NATIVES

Indian Health Service American Indians and Alaska Natives

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive*	Hypertensive		
					Percent Aware*	Percent Treated*	Percent Controlled*
Males							
18-24	345	137	84				
25-34	553	137	88				
35-44	556	137	89				
45-54	413	139	88				
55-64	238	143	86				
65-74	159	146	81				
75+	0	-	-				
Females							
18-24	106	135	83				
25-34	207	132	86				
35-44	305	136	88				
45-54	322	140	86				
55-64	305	144	83				
65-74	296	149	79				
75+	0	-	-				

*Data unavailable.

MRFIT

American Indians, Combined for all Clinics

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive*	Hypertensive		
					Percent Aware*	Percent Treated*	Percent Controlled*
Males							
18-24	0	-	-				
25-34	0	-	-				
35-44	182	128	84				
45-54	132	129	83				
55-64	0	-	-				
65-74	0	-	-				
75+	0	-	-				
Females							
18-24	0	-	-				
25-34	0	-	-				
35-44	0	-	-				
45-54	0	-	-				
55-64	0	-	-				
65-74	0	-	-				
75+	0	-	-				

*Data unavailable.

Navajo Adolescent American Indian Children

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive*	Hypertensive		
					Percent Aware*	Percent Treated*	Percent Controlled*
Males							
3-5	0	-	-				
6-9	0	-	-				
10-12	0	-	-				
13-15	73	108.0	64.5				
16-17	95	115.0	69.0				
Females							
3-5	0	-	-				
6-9	0	-	-				
10-12	0	-	-				
13-15	61	107.0	65.3				
16-17	114	105.0	63.7				

*Category not applicable for this study.

Navajo Health & Nutrition American Indians

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive	Hypertensive		
					Percent Aware	Percent Treated	Percent Controlled
Males							
18-24	68	117	73	6	100	0	0
25-34	86	119	77	24	43	5	5
35-44	47	119	79	21	100	10	10
45-54	38	121	79	39	67	27	27
55-64	29	127	76	45	69	38	38
65-74	27	126	75	70	58	37	37
75+	18	132	78	61	64	36	36
Females							
18-24	91	106	66	10	89	11	11
25-34	125	105	67	7	100	0	0
35-44	94	111	72	16	93	27	27
45-54	74	117	74	26	84	26	26
55-64	75	121	73	35	62	42	42
65-74	42	128	71	40	71	29	29
75+	14	132	70	71	60	50	50

Pima Indians American Indians

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive	Hypertensive		
					Percent Aware*	Percent Treated	Percent Controlled
Males							
18-24	443	123	72	16		10	7
25-34	516	126	77	27		18	9
35-44	304	126	80	33		40	21
45-54	264	132	83	52		50	20
55-64	138	136	83	64		54	24
65-74	100	140	78	67		37	12
75+	44	142	80	64		32	7
Females							
18-24	552	111	64	3		19	19
25-34	695	113	69	7		25	21
35-44	466	118	73	18		49	34
45-54	344	127	77	36		56	26
55-64	237	134	77	51		54	27
65-74	135	139	74	61		51	22
75+	37	137	74	68		40	28

*Data unavailable.

St. Lawrence Island Yupik Eskimos

Age (Years)					Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive	Hypertensive			
									Percent Aware	Percent Treated	Percent Controlled	
Males												
18-24		0	-	-	-	-	-	-	-	-	-	
25-34		0	-	-	-	-	-	-	-	-	-	
35-44		5	114	74	0	-	-	-	-	-	-	
45-54		10	113	71	10	100	100	100	100	100	100	
55-64		8	118	71	25	50	50	50	50	50	50	
65-74		4	114	66	25	100	100	100	100	100	100	
75+		3	111	55	33	100	100	100	100	100	100	
Females												
18-24		0	-	-	-	-	-	-	-	-	-	
25-34		0	-	-	-	-	-	-	-	-	-	
35-44		5	119	77	0	-	-	-	-	-	-	
45-54		14	113	71	14	50	50	50	50	0	0	
55-64		7	120	70	14	100	100	100	100	0	0	
65-74		9	130	62	67	67	50	50	50	17	17	
75+		5	133	66	60	67	67	67	67	0	0	

Strong Heart American Indians

Age					Hypertensive			Hypertensive		
Number of Subjects		Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive	Percent Aware	Percent Treated	Percent Controlled			
Males										
18-24	0	-	-	-	-	-	-			
25-34	0	-	-	-	-	-	-			
35-44	0	-	-	-	-	-	-			
45-54	961	126	81	35	76	53	31			
55-64	579	130	79	41	69	51	26			
65-74	306	134	76	49	70	55	29			
75+	0	-	-	-	-	-	-			
Females										
18-24	0	-	-	-	-	-	-			
25-34	0	-	-	-	-	-	-			
35-44	0	-	-	-	-	-	-			
45-54	1278	123	76	28	82	63	36			
55-64	927	129	75	41	80	66	32			
65-74	498	137	72	56	69	51	27			
75+	0	-	-	-	-	-	-			

ASIAN AND PACIFIC ISLANDER AMERICANS

Chicago Children Asian and Pacific Islander American Children

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive*	Hypertensive		
					Percent Aware*	Percent Treated*	Percent Controlled*
Males							
3-5	15	97.5	58.4				
6-9	119	106.9	58.9				
10-12	10	115.5	64.3				
13-15	0	-	-				
16-17	0	-	-				
Females							
3-5	21	100.0	59.0				
6-9	124	106.6	60.7				
10-12	14	113.6	68.3				
13-15	0	-	-				
16-17	0	-	-				

*Category not applicable for this study.

Hawaii, Los Angeles, and Hiroshima Japanese Living in Hawaii

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive	Hypertensive		
					Percent Aware	Percent Treated	Percent Controlled
Males							
18-24	1	134	74	0	-	-	-
25-34	8	116	56	0	-	-	-
35-44	9	124	75	22	100	100	0
45-54	17	127	76	41	71	43	29
55-64	38	129	77	47	72	56	22
65-74	86	141	78	58	70	58	20
75+	67	148	73	69	50	43	13
Females							
18-24	1	124	74	0	-	-	-
25-34	6	115	69	0	-	-	-
35-44	15	114	70	7	0	0	0
45-54	24	125	74	29	71	71	43
55-64	86	132	76	45	77	62	41
65-74	118	142	75	60	65	56	14
75+	46	152	73	85	77	67	13

Hawaii, Los Angeles, and Hiroshima Japanese Living in Japan

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive	Hypertensive		
					Percent Aware	Percent Treated	Percent Controlled
Males							
18-24	0	-	-	-	-	-	-
25-34	13	123	71	15	0	0	0
35-44	31	124	76	26	0	0	0
45-54	33	121	78	18	17	17	17
55-64	78	134	80	33	12	12	4
65-74	58	140	82	53	10	10	3
75+	22	149	80	73	19	19	13
Females							
18-24	0	-	-	-	-	-	-
25-34	12	119	69	17	0	0	0
35-44	108	119	73	13	7	0	0
45-54	201	125	76	22	5	5	0
55-64	297	129	77	32	20	20	3
65-74	101	134	77	36	25	25	0
75+	10	131	74	40	0	0	0

Hawaii, Los Angeles, and Hiroshima Japanese Living in Los Angeles

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive	Hypertensive		
					Percent Aware	Percent Treated	Percent Controlled
Males							
18-24	5	112	70	0	-	-	-
25-34	16	117	79	6	100	100	0
35-44	29	126	74	24	29	14	0
45-54	56	127	83	32	28	22	11
55-64	90	138	84	60	30	19	4
65-74	111	137	82	50	42	36	4
75+	51	142	82	57	38	24	3
Females							
18-24	9	109	71	0	-	-	-
25-34	14	109	71	0	-	-	-
35-44	55	113	74	11	67	67	33
45-54	67	120	77	18	75	75	33
55-64	153	133	81	44	49	35	7
65-74	148	136	81	54	54	44	13
75+	44	143	81	61	26	19	4

Honolulu Heart Japanese Americans

Age					Hypertensive			Hypertensive		
Age (Years)		Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive	Percent Aware	Percent Treated	Percent Controlled		
Males										
18-24		0	-	-	-	-	-	-		
25-34		0	-	-	-	-	-	-		
35-44		0	-	-	-	-	-	-		
45-54		0	-	-	-	-	-	-		
55-64		445	136	82	53	81	49	24		
65-74		752	139	80	59	84	52	20		
75+		181	145	79	67	89	44	13		
Females										
18-24		0	-	-	-	-	-	-		
25-34		0	-	-	-	-	-	-		
35-44		0	-	-	-	-	-	-		
45-54		0	-	-	-	-	-	-		
55-64		0	-	-	-	-	-	-		
65-74		0	-	-	-	-	-	-		
75+		0	-	-	-	-	-	-		

Kaiser Permanente Chinese Americans

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive*	Hypertensive		
					Percent Aware*	Percent Treated*	Percent Controlled*
Males							
18-24	314	121	72				
25-34	858	119	73				
35-44	519	120	75				
45-54	506	125	79				
55-64	370	132	81				
65-74	139	138	81				
75+	18	154	82				
Females							
18-24	483	112	68				
25-34	1109	111	68				
35-44	552	113	72				
45-54	549	123	77				
55-64	361	134	80				
65-74	101	147	82				
75+	12	167	87				

*Data unavailable.

Kaiser Permanente Filipino Americans

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive*	Hypertensive		
					Percent Aware*	Percent Treated*	Percent Controlled*
Males							
18-24	173	121	71				
25-34	551	122	74				
35-44	477	123	77				
45-54	258	129	81				
55-64	140	139	83				
65-74	92	142	81				
75+	19	146	81				
Females							
18-24	347	115	69				
25-34	822	115	71				
35-44	657	119	75				
45-54	401	131	80				
55-64	191	140	83				
65-74	27	143	82				
75+	0	-	-				

*Data unavailable.

Kaiser Permanente Japanese Americans

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive*	Hypertensive		
					Percent Aware*	Percent Treated*	Percent Controlled*
Males							
18-24	58	122	71				
25-34	204	120	73				
35-44	122	119	75				
45-54	129	124	78				
55-64	133	131	80				
65-74	36	137	79				
75+	2	150	89				
Females							
18-24	116	113	67				
25-34	284	110	68				
35-44	180	114	71				
45-54	217	123	76				
55-64	193	130	77				
65-74	22	137	79				
75+	1	150	76				

*Data unavailable.

Kaiser Permanente Other Asian Americans

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive*	Hypertensive		
					Percent Aware*	Percent Treated*	Percent Controlled*
Males							
18-24	61	120	71				
25-34	197	118	71				
35-44	177	118	75				
45-54	68	123	79				
55-64	27	130	78				
65-74	5	132	78				
75+	0	-	-				
Females							
18-24	104	112	67				
25-34	258	112	68				
35-44	155	117	73				
45-54	72	127	79				
55-64	23	127	78				
65-74	3	139	74				
75+	1	127	83				

*Data unavailable.

Molokai Native Hawaiians

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive	Hypertensive		
					Percent Aware	Percent Treated	Percent Controlled
Males							
18-24	17	122	67	6	100	100	0
25-34	24	121	73	8	50	0	0
35-44	34	125	79	35	75	33	33
45-54	30	130	79	37	91	27	18
55-64	13	131	80	31	50	25	0
65-74	0	-	-	-	-	-	-
75+	0	-	-	-	-	-	-
Females							
18-24	13	110	61	0	-	-	-
25-34	33	108	66	6	100	50	50
35-44	39	118	71	21	100	75	50
45-54	34	135	78	41	71	50	36
55-64	12	132	77	33	100	25	25
65-74	0	-	-	-	-	-	-
75+	0	-	-	-	-	-	-

MRFIT

Asian Americans, Combined for all Clinics

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive*	Hypertensive		
					Percent Aware*	Percent Treated*	Percent Controlled*
Males							
18-24	0	-	-				
25-34	0	-	-				
35-44	2226	124	83				
45-54	1874	127	85				
55-64	0	-	-				
65-74	0	-	-				
75+	0	-	-				
Females							
18-24	0	-	-				
25-34	0	-	-				
35-44	0	-	-				
45-54	0	-	-				
55-64	0	-	-				
65-74	0	-	-				
75+	0	-	-				

*Data unavailable.

Seattle Japanese Japanese Americans

Age					Hypertensive		
Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive	Hypertensive		
					Percent Aware	Percent Treated	Percent Controlled
Males							
18-24	0	-	-	-	-	-	-
25-34	7	124	76	29	0	0	0
35-44	88	123	76	10	67	33	33
45-54	56	134	82	39	82	50	14
55-64	136	138	80	54	82	70	35
65-74	62	143	81	61	74	63	21
75+	0	-	-	-	-	-	-
Females							
18-24	0	-	-	-	-	-	-
25-34	10	117	69	0	-	-	-
35-44	87	116	71	6	100	60	60
45-54	42	128	79	36	53	20	7
55-64	93	131	76	38	77	63	31
65-74	76	141	77	64	67	49	10
75+	1	128	80	0	-	-	-

THE MULTIPLE RISK FACTOR INTERVENTION TRIAL SCREENING DATA

MRFIT

Black Americans, Combined for all Clinics

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive*	Hypertensive		
					Percent Aware*	Percent Treated*	Percent Controlled*
Males							
18-24	0	-	-				
25-34	0	-	-				
35-44	10843	131	86				
45-54	10567	136	88				
55-64	0	-	-				
65-74	0	-	-				
75+	0	-	-				
Females							
18-24	0	-	-				
25-34	0	-	-				
35-44	0	-	-				
45-54	0	-	-				
55-64	0	-	-				
65-74	0	-	-				
75+	0	-	-				

*Data unavailable.

MRFIT

White Americans, Combined for all Clinics

Age (Years)	Number of Subjects	Mean SBP (mm/Hg)	Mean DBP (mm/Hg)	Percent Hypertensive*	Hypertensive		
					Percent Aware*	Percent Treated*	Percent Controlled*
Males							
18-24	0	-	-				
25-34	0	-	-				
35-44	135992	127	83				
45-54	154358	131	85				
55-64	0	-	-				
65-74	0	-	-				
75+	0	-	-				
Females							
18-24	0	-	-				
25-34	0	-	-				
35-44	0	-	-				
45-54	0	-	-				
55-64	0	-	-				
65-74	0	-	-				
75+	0	-	-				

*Data unavailable.

THIRD NATIONAL HEALTH AND NUTRITION
EXAMINATION SURVEY, PHASE I

NHANES III

Non-Hispanic Black Americans

Age (Years)					Number of Subjects*		Mean SBP (mm/Hg)**	Mean DBP (mm/Hg)**	Percent Hypertensive*	Hypertensive			
										Percent Aware*	Percent Treated*	Percent Controlled*	
Males													
18-24		177	118	70	5	52	0	0					
25-34		268	121	75	12	74	34	25					
35-44		230	127	81	33	67	39	19					
45-54		134	133	84	47	67	46	16					
55-64		142	137	82	62	71	55	23					
65-74		151	141	78	65	73	63	25					
75+		74	141	74	65	58	49	22					
Females													
18-24		215	107	65	1	29	29	29					
25-34		260	111	69	6	72	40	31					
35-44		237	119	77	20	64	53	32					
45-54		132	129	79	45	82	63	28					
55-64		162	138	77	69	85	71	32					
65-74		143	143	75	77	83	74	27					
75+		105	144	74	78	77	66	23					

*Unweighted data.
**Weighted data.

NHANES III

Non-Hispanic White Americans

Age (Years)	Number of Subjects*	Mean SBP (mm/Hg)**	Mean DBP (mm/Hg)**	Percent Hypertensive*	Hypertensive		
					Percent Aware*	Percent Treated*	Percent Controlled*
Males							
18-24	177	119	70	5	20	0	0
25-34	303	120	75	10	53	20	8
35-44	282	120	79	15	65	33	16
45-54	262	126	80	35	68	49	21
55-64	302	131	79	44	74	57	31
65-74	358	140	76	58	65	54	19
75+	503	142	74	62	54	44	14
Females							
18-24	198	106	65	0	-	-	-
25-34	300	110	69	3	76	36	15
35-44	288	112	72	8	87	66	45
45-54	232	121	75	25	85	68	43
55-64	287	131	76	47	77	60	33
65-74	334	137	73	58	80	68	26
75+	559	146	72	75	64	54	16

*Unweighted data.

**Weighted data.

DISCRIMINATION PROHIBITED: Under provisions of applicable public laws enacted by Congress since 1964, no person in the United States shall, on the grounds of race, color, national origin, handicap, or age, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity (or, on the basis of sex, with respect to any education program or activity) receiving Federal financial assistance. In addition, Executive Order 11141 prohibits discrimination on the basis of age by contractors and subcontractors in the performance of federal contracts, and Executive Order 11246 states that no federally funded contractor may discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. Therefore, the *NATIONAL HEART, LUNG, AND BLOOD INSTITUTE* must be operated in compliance with these laws and Executive Orders.
